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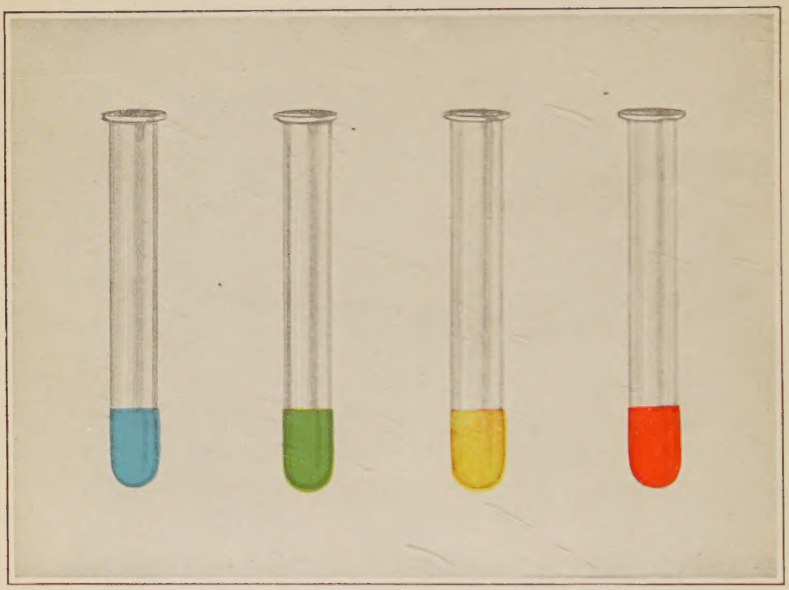


None. Trace. About 1%. Over 2%.

The Benedict Test for Sugar in the Urine.

A

DIABETIC MANUAL

FOR THE

MUTUAL USE OF DOCTOR AND PATIENT

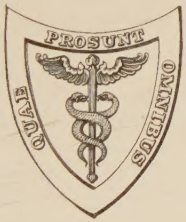
BY

ELLIOTT P. JOSLIN, M.D.

CLINICAL PROFESSOR OF MEDICINE, HARVARD MEDICAL SCHOOL; CONSULTING PHYSICIAN, BOSTON CITY HOSPITAL; PHYSICIAN TO NEW ENGLAND DEACONESS HOSPITAL, BOSTON, MASS.

Illustrated

FOURTH EDITION, THOROUGHLY REVISED



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TO

THOSE INDIVIDUALS WHO HAVE CONQUERED DIABETES

BY LIVING LONGER WITH IT

THAN THEY WERE EXPECTED TO LIVE WITHOUT IT

74825

PREFACE.

Successive editions of the Manual have registered progress in diabetes. The education of the patient about his disease was almost an innovation in 1918 and the possibility of its prevention by the avoidance of obesity in middle life was a forward step the next year. In the third edition early diagnosis and the use of insulin were emphasized, and now in the fourth edition I have tried to develop three thoughts, first, that the patient can master his disease if he so wills, second, that his own length of days after his diabetes begins is in some degree a measure of the success he achieves, third, that he has an excellent chance by living long and well to be an explorer of regions of diabetes, hitherto unknown, and thus to open up trails toward health and the cure of diabetes which others can more easily follow. Five of my living patients have progressed to a stage which to me five years ago would have seemed incredible and the best part of it all is that their improvement continues and who can say that it must cease?

Purposely much about diabetes and its treatment has been omitted, because within the last year the fourth edition of the Author's monograph upon "The Treatment of Diabetes Mellitus," designed for physicians, has been issued by the publishers of the Manual.

In an "Author's Apology" for a well-known classic occurred certain lines which have influenced me in the preparation of this diminutive treatise. I only wish that my language was as simple and that my book would say to my patients as has his to readers for nearly three hundred years—

> "Art thou forgetful? Wouldest thou remember
> From New-year's-day to the last of December?
> Then read my Fancies, they will stick like Burrs,
> And may be to the Helpless, Comforters."

For assistance I am indebted to so many—my associates, Doctors Root, White, and Curtis, my Secretaries, Case No. 632, Miss Hunt, and for illustrations to Dr. Stephen A. Foster and Case No. 1469; to Messrs Lea & Febiger for helpful counsel and innumerable courtesies.

E. P. J.

Boston, Mass.

CONTENTS.

CHAPTER I.

Diabetes 17

CHAPTER II.

The Recent Improvement in Diabetic Treatment . . . 22

CHAPTER III.

The Story of Diabetes and Insulin 26

CHAPTER IV.

Questions and Answers for Diabetic Patients 33

CHAPTER V.

Diabetic Arithmetic 42

CHAPTER VI.

Efficiency in Visits to a Doctor 54

CHAPTER VII.

Hygiene for the Diabetic 60

CHAPTER VIII.

The Diet of Normal Individuals 65

CHAPTER IX.

The Diet of Diabetic Individuals 75

CHAPTER X.

The Treatment of Diabetes with Diet and Insulin 95

CHAPTER XI.

Acid Intoxication—Acidosis—Diabetic Coma 119

CHAPTER XII.

The Differences Between Diabetic Coma and Insulin Reactions 125

CHAPTER XIII.

Care of the Teeth 127

CHAPTER XIV.

Care of the Skin and Feet 129

CHAPTER XV.

Surgery in Diabetes 134

CHAPTER XVI.

Treatment of Constipation and Diarrhea 136

CHAPTER XVII.

Heredity and Marriage 140

CHAPTER XVIII.

Expectation of Life. Prognosis 142

CHAPTER XIX.

The Prevention of Diabetes 145

CHAPTER XX.

Weight Peculiarities 149

CHAPTER XXI.

Cost of a Diabetic Diet 156

CHAPTER XXII.

An Insulin Syringe 160

CHAPTER XXIII.

Dogs, Diabetics and Their Friends 162

CHAPTER XXIV.

Diabetic Children 164

CHAPTER XXV.

Dietetic Suggestions, Recipes and Menus 172

CHAPTER XXVI.

Foods and Their Composition 201

CHAPTER XXVII.

Selected Laboratory Tests Useful in Diabetic Treatment 239

DIABETIC MANUAL.

CHAPTER I.

DIABETES.

Introduction.—Diabetes is a disease in which part of the food escapes utilization and appears as sugar in the urine. If the patient eats less sugar and starch and makes up for this loss of nourishment by taking more fat such as cream, butter, olive oil, and fat meat, most of the symptoms of diabetes will vanish. Should the urine not become sugar-free with this change in diet, insulin, one of the greatest of medical discoveries, will help to bring this about. Not only will the proper use of insulin free the urine of sugar, but it makes possible the return of health to the patient and the prospect of a long life.

The diet of a diabetic today need not be severe. He should be able to eat without injury to himself, either with or without the aid of insulin, the food which is represented by the following meals.

Breakfast: Fruit, one portion; cereal; egg and bacon; coffee and cream.

Lunch or Supper: Meat or fish, nearly all vegetables save the very starchy ones such as potato and corn, and a portion of fruit for dessert.

Dinner: A meal similar to that at noon but rather more abundant and usually containing a salad.

During the day ½ pint of cream is generally allowed and usually a moderate quantity of butter, two Uneeda biscuits or other crackers of similar size. Clear broths, coffee, tea, cocoa shells and cracked cocoa can be taken without allowance for food content.

Diabetes is a common disease in middle life, but unusual in the young and very rare in children. There are two people who have diabetes above forty years of age for one who develops it under forty. It seldom occurs in persons over forty years of age unless they are fat, but why it develops in the young is an unsolved mystery.

Death from diabetes, pure and simple, is needless, if the patient follows the rules of treatment, and most of the complications of diabetes are avoidable if he will learn the necessary precautions.

In diabetes sugar is found in the urine and there is also an excess in the blood. This is due to the body having lost the power to use the food which has been eaten. Most of the sugar which leaks through the kidneys into the urine comes from sugar and starch (carbohydrate), but some can be formed out of meat, fish, eggs and cheese (protein) and a little from pure fat. Healthy persons do not have sugar in the urine, because the secretion of special cells of the pancreas, a gland in the abdomen often called the sweetbread, stores the sugar in the body either as animal starch (glycogen), or makes possible its change to body fat or its use for energy as fast as it is formed.

The object of the treatment of diabetes is to prevent the loss of sugar in the urine. This is accomplished: (1) by altering the diet so that the patient will take less than usual of sugar and starch and in general by eating moderate quantities of all foods; (2) by exercise which favors the burning up of sugar in the muscles; (3) by insulin which is a drug made out of cells of the pancreas of an animal. This manufactured insulin replaces the diabetic's insulin which his own pancreas has ceased to produce in sufficient quantity. Treatment with diet alone was formerly unsatisfactory, because the diet was often too strict for comfort or occasionally for life. The patients were sometimes too weak even to benefit from exercise. The discovery of insulin is, therefore, a great boon, because with its help the patient can eat all he needs to enable him to work or play and to become a useful member of society.

The Advantages of Diabetes Over Other Chronic Diseases.—It is perfectly true that diabetes is a chronic disease, but, unlike rheumatism and cancer, it is painless; unlike tuberculosis, it is clean and not contagious, and in contrast to many diseases of the skin, it is not unsightly. Moreover, it is susceptible to treatment, and the downward course of a patient can be promptly checked. Treatment, however, is by diet as well as by insulin and the patients who know the most, conditions being equal, can live the longest. There is no disease in which an understanding by the patient of the methods of treatment avails as much. Brains count. But knowledge alone will not save the diabetic. This is a disease which tests the character of the patient, and for success in withstanding it, in addition to wisdom, he must possess honesty, self-control and courage. These qualities are as essential with as without insulin. Many of my patients have actually lived longer than would have been expected of them had they been normal, healthy people, and far longer than their similar fat friends whose obesity led to their death by way of heart or kidneys. For the diabetic this is a demonstration and a challenge.

Definition of Diabetes Mellitus.—Diabetes is a disease characterized by an increase of sugar in the blood and the excretion of sugar in the urine; it is dependent upon disease of the pancreas, particularly of the islands of Langerhans, whose secretion—insulin—not only promotes the conversion of sugar in the blood (glucose) into glycogen and the deposition of the latter in the liver and muscles, but also exerts an influence upon the conversion of protein and fat into sugar.

My rule in the treatment of diabetes is to consider any patient who has sugar in the urine demonstrable by any of the common tests to have diabetes mellitus and to treat him as a diabetic until the contrary is proved. Occasionally an individual has sugar in the urine (glycosuria) and yet the sugar in the blood is not above normal. Such a patient is not considered to have diabetes, but to have renal glycosuria. The development of diabetes may be gradual or acute and with or without symptoms. It is fortunate that the disease can be so readily discovered, for unlike many diseases whose

beginnings can be detected only by specialists or disclosed by the help of elaborate and expensive methods, such as the Roentgen-rays, diabetes can be easily and promptly recognized by any physician who will be on the watch for it and will examine the urine of his patient for sugar. The subsequent behavior of the disease and the effect of treatment are also readily regulated by simple urinary examinations; herein the diabetic has a great advantage over many other patients.

Symptoms.—The symptoms of diabetes are thirst, hunger and the passage of an increased quantity of urine (polydipsia, polyphagia and polyuria) with loss of weight and strength. Itching of the skin, particularly about the genitals, is common. There is no one symptom always present and indeed there are many diabetics who have no symptoms at all. This is the reason why it is so desirable for everybody to have routine examinations of the urine at least once a year and always when indisposed, because it is only in this way that many cases will be discovered. Pains in joints or nerves are not symptoms of diabetes and are not the result of diabetes, but are to be explained by the presence of some complicating disease. A properly treated case of diabetes should feel well and have no symptoms. The responsibility for maintaining this favorable state must rest in large measure upon the patient himself. He must learn the diet and the dose of insulin which are best for him and must constantly control his condition by the examination of his urine. He is his own nurse, doctor's assistant and chemist. If he tries to be his own doctor, he will come to grief. To acquire the requisite knowledge for his triple vocation requires diligent study, but the prize offered is worth while, for it is nothing less than life itself.

Source of Urinary Sugar.—The sugar in the urine of diabetic patients is derived from their food, and chiefly from that consumed within the preceding twenty-four hours. The effects of a meal begin to show within ten minutes by an increase of sugar in the blood and by the appearance of sugar in the urine. Most of the sugar in the urine comes from carbohydrate (sugar and starch), but in extremely severe cases as much as 58 per cent of the protein (examples of which

are lean of meat and fish, white of egg, and curd of milk) and 10 per cent of the fat in the diet may change to sugar.

Test of Successful Treatment.—Improvement in diabetes takes place when the urine is kept free from sugar. The annoying symptoms of the untreated diabetic then vanish. Under such conditions the power of the pancreas to assimilate carbohydrate is increased. Conversely, if the urine is not free from sugar, the patient is generally only holding his own, or more likely is growing worse. Professor Naunyn of Germany, who for a generation was perhaps the leading specialist in diabetes, observed that even severe cases if treated early did well, whereas mild cases if neglected usually did poorly.

Examination of the blood for sugar gives valuable information in the treatment of diabetes. The total quantity of sugar in the blood of the entire body is surprisingly small. Before meals, it amounts to about 1 teaspoonful (5 grams); and after meals, if the pancreas with its insulin did not prevent its rising above a scant 2 teaspoonfuls, sugar would slip through into the urine and the individual would be a diabetic. The normal percentage of sugar in the blood is 0.1 per cent, but after a meal it may rise to 0.16 per cent without sugar appearing in the urine. The adjustment of the mechanism by which insulin regulates the quantity of sugar in the blood within these narrow limits is truly wonderful.

The sugar in the blood usually rises above normal before sugar appears in the urine. Consequently, if information can be learned about the blood sugar, one often anticipates the information which an examination of the urine alone would show. The knowledge about the blood sugar is still fragmentary, and it must be acknowledged that many cases of diabetes have lived comfortably without a single blood-sugar estimation. However, analyses of the blood sugar are of much value, particularly in the diagnosis of doubtful cases.

CHAPTER II.

THE RECENT IMPROVEMENT IN DIABETIC TREATMENT.

One often hears the remark that patients with diabetes live for years with little inconvenience to themselves, even though strict rules of diet are neglected. This may be a consoling thought to some weak-willed patient, but if the average diabetic yields to such seductive advice, the probability is overwhelming that he will later pay the penalty. Furthermore, such statements are not true. Their origin lies in the favorable course of the large number of mild cases of diabetes, but just as it is a serious blunder in war to disparage the strength of the enemy, so it is in diabetes. Still more recently certain diabetics have improved so much with insulin that they have felt that diet, and occasionally even insulin, too, could be disregarded. Of these latter I have known several who have already died, even though their disease was of short duration.

How serious in the past diabetes has really been, and at the same time how much the methods of treatment have improved during the recent years, is best shown by the statistics for diabetes of the Massachusetts General Hospital. Between 1824 and 1898 for every 100 diabetics who entered the institution 27 died within its walls, but during 1918, which is long before the discovery of insulin, so great had been the improvement by dietetic methods alone that there were but 4 deaths per 100 admissions. During 1923 at the New England Deaconess Hospital and Mrs. Leatherbee's, across the street, 822 cases of diabetes were treated by various physicians with 14 deaths. Still more encouraging are the data for my 303 diabetic children for the twenty-two months ending July 1, 1928. Formerly children lived only a few

years, but in this group of diabetic children the mortality was limited to 6 children or at the rate of 1 child per 100 per year. Concerning these deaths, it is conservative, pathetic, yet

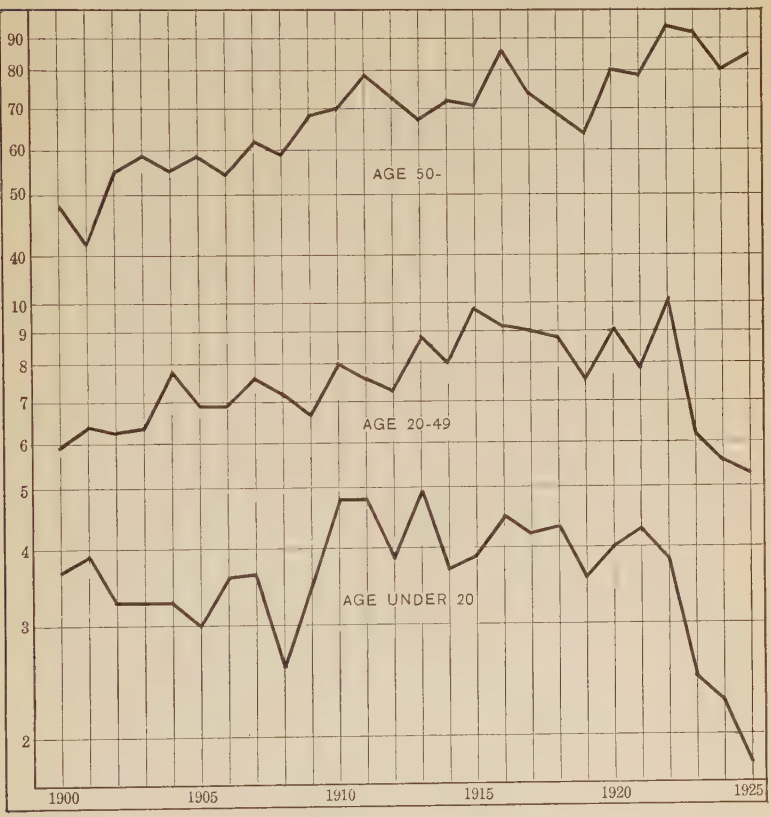


FIG. 1.—Average death-rates from diabetes in Massachusetts by age. Death-rate per 100,000 population.

helpful from the point of view of future statistics, to state that one-half were needless. It is gratifying that this advance in treatment has come through hard work and not through chance, and that multitudes of scientific men and

women have shared in it. All will gladly acknowledge the service of Dr. Frederick M. Allen, fifteen years ago, in bringing this about by his insistence upon the harmfulness of overfeeding the patient and the desirability of the patient learning to test his own urine, and more recently through the discovery of insulin by Banting and Best.

Deaths from diabetes in children in Massachusetts have almost reached the vanishing point. Deaths between the ages of twenty and forty years are now the lowest for this century and the only diabetic death-rate which is increasing is that among those aged fifty years or more. (Fig. 1, p. 23.)

The favorable nature of recent hospital statistics demonstrates that the opportunity for further improvement in the treatment of diabetes lies not in the hospital but in the home. To this end a campaign must be aggressively waged. If the mortality can be reduced nearly to zero in the hospital, these same results ought to be attained outside the hospital, for there is no reason why the methods which have made hospital treatment safe should not be employed in making treatment in the home safe. It is unreasonable to expect that the ultimate diabetic mortality in the home will be as low as that in the hospital, because of the shorter duration of stay in the latter, but the time has arrived when the accidental and avoidable deaths, which have now been largely eliminated from the statistics of the best hospitals, should also be eliminated from private practice. The secret of the success of hospital improvement lies in the close and continuous observation of the patient by the doctor. For success in home treatment, close and continuous observation of the patient by himself under the systematic guidance of a physician is just as essential.

If every diabetic in this country would see his doctor once a month, in my opinion the duration of life of those diabetics would be doubled. *No diabetic should let three months go by without a visit to a physician.* Everybody should have a health examination once a year and after fifty years of age twice a year if he wishes to get all the health which his body affords.

Insulin has wrought a revolution in the lives of severe and

moderately severe diabetics. It allows such individuals to take part in large measure in all that goes on about them, just as diet alone enables the mild diabetic to lead a successful existence. With the help of insulin I have seen children go back to school and enter college, young women and men get married and have healthy children, ministers secure a parish, lawyers reënter court, doctors carry on a hospital service, nurses resume work. It is true nearly all of these activities are mental or professional activities; consequently, it is well to record that mechanics have been enabled again to carry on occupations which had been renounced for many months and even to perform strenuous labor. And that is not all. A diabetic, the father of eight living children, who entered the hospital with acid poisoning, double valvular heart disease and a bleeding duodenal ulcer, under insulin was freed from sugar and acid so that he underwent operation successfully on March 12, 1923. In three weeks he left the hospital, in another three weeks returned to work, and on February 26, 1924, reported that he had not lost a day's work since he began treatment. Insulin, therefore, not only changes the severe and moderately severe diabetic into a milder diabetic, but protects all diabetics in times of emergency.

Insulin is your life insurance policy. It is a gift from Banting and Best.

FIG. 2.—How Barbara feels after taking insulin. Case No. 4702. Age at onset eight years; duration to February, 1929, three years, nine months. Recent diet, carbohydrate 75 grams, protein 70–75 grams, fat 110 grams. Insulin, 20 0–15–5 units. (See Fig. 38 p. 114.)

CHAPTER III.

THE STORY OF DIABETES AND INSULIN.

In India and Rome there are hints of a knowledge of diabetes, but Paracelsus, who was born two years before Columbus discovered America, was the first to record that if a measure of urine of a diabetic patient was evaporated to a syrupy consistency it yielded 4 ounces of salt. Thomas Willis, born the year after the Pilgrims landed at Plymouth, observed that the urine of a diabetic tasted wonderfully sweet as if imbued with honey and in 1775 Matthew Dobson proved by fermenting the urine that the sweet taste was actually due to sugar. John Rollo, 1796, began to treat diabetics by diet and gave them animal food and vegetables such as our 5 per cent carbohydrate vegetables. Minkowski in 1889 proved diabetes was concerned with the pancreas, because when he removed this gland from a dog, severe diabetes occurred. In 1921 Banting and Best discovered that insulin, an extract of special cells in the pancreas, when injected into a diabetic, would control the disease.

Banting had read that if the duct through which the digestive juice of the pancreas flows into the intestine was tied off, the entire pancreas would atrophy save the islands of Langerhans which produce insulin. Banting and Best reasoned that if they performed this experiment upon a dog and later removed the pancreas and extracted this tissue, so rich in islands but almost devoid of other cells, they would obtain the substance which would help diabetics. They performed the experiment and were rewarded by finding that the extract of the islands caused the sugar in the blood of diabetic dogs to fall to normal and sugar to disappear from the urine. They discovered insulin. The work was performed in the laboratory of Professor Macleod of Toronto

and subsequently they had the assistance of Professor Collip in refining the active principle of the extract which was named insulin. On account of the discovery of insulin the Nobel Prize in Medicine was bestowed upon Banting and Macleod.

F. G. Banting was a young orthopedic surgeon with zeal for research undampened by four years' service at the front. He received the assistance of his friend, C. H. Best, who, although a second-year medical school student, was trained in physiological research. Thus, just a generation had elapsed since that other epoch-making discovery in diabetes was announced by von Mering and Minkowski, when they proved that fatal diabetes would follow complete removal of the pancreas. (See Fig. 3, p. 28.)

When "Charlie" Best, the medical student, helped Banting to discover insulin, he proved that a medical student was *ipso facto* an investigator and deserved to be regarded as such. Would it not be worth while for an affluent diabetic to find a young doctor or a medical student and to aid him in his scientific endeavors? (See Fig. 4, p. 29.)

The Pancreas and Its Islands of Langerhans.—The cause of diabetes is usually considered to be due to something wrong with the pancreas. This gland has a double action. It forms a digestive juice which, as a matter of fact, is the most important digestive juice in the body and this it discharges into the intestine; and second, it produces insulin which is discharged into the blood, and this regulates the use of the sugar formed from the food. In animals the pancreas is known as the sweetbread and lies behind the stomach near the liver. The pancreatic digestive juice is manufactured throughout the gland, but insulin is formed by collections of cells which occur in groups named the islands of Langerhans after the young man in Berlin who discovered them in 1869. It is possible experimentally to produce diabetes by removing more than nine-tenths of the pancreas, because then there would be too few islands left to make the insulin which regulates the action of the sugar and starch. In man for some reason, as yet unknown, the islands of Langerhans may become diseased or cease to function and diabetes appears.

If the diabetic patient could secure a new pancreatic gland he would be cured. I would not be surprised if sometime we could promise a patient that his old pancreas could be repaired. (See Figs. 5, 6, 7, p. 30.)

A word about these islands of Langerhans. These consist of groups of cells, varying in number from a quarter of a million to a million or more in a single pancreas. They

FIG. 3.—Dr. F. G. Banting in 1924.

are scattered throughout the gland, and yet they form but a twentieth part of it. Their total weight is about that of a buffalo nickel. Originally they were described by Paul Langerhans in Berlin in 1869, but it was not until 1901 and 1902 that Opie, in America, and Ssobolew, in Russia, showed that disease of the Langerhans islands and not of the rest of the pancreas was the real cause of diabetes. (Figs. 8, 9, pp. 31, 32.)

Insulin is prepared for general use dissolved in a liquid.

The dose is measured in units. The standard clinical unit represents one-third of that amount of insulin which will lower the blood sugar of a rabbit to 0.045 per cent within five hours. At this point various symptoms appear which end in coma and convulsions, and hence this definite point is taken for the standardization of the unit.

FIG. 4.—A photograph of Dr. C. H. Best taken by Professor A. V. Hill in the Sir William Bayliss Laboratory at University College, London.

One unit of insulin when injected into a diabetic will enable him to utilize 1 to 2 grams additional carbohydrate. This is about the quantity of carbohydrate in a small Educator biscuit or something less than one-half a lump of granulated sugar. Apparently the power of insulin varies with different patients and under different conditions with the same patient. Therefore, one must always proceed cautiously when administering the first dose. The number of units taken in a day

by a patient usually lies between 5 and 50 units divided between one, two, three, or four injections.

If an excess of insulin is given, the blood sugar falls below the normal of 0.1 per cent and symptoms appear which are known as an "insulin reaction." The most striking of these are hunger, sweating, trembling and, unless treatment is instituted, unconsciousness may result. Fortunately these

Fig. 4

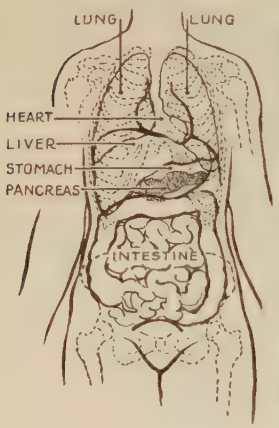


Fig. 5

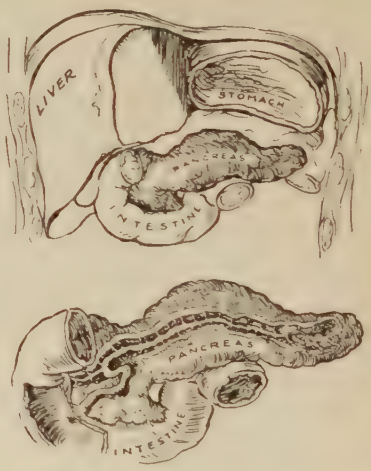


Fig. 6

Fig. 5. Diagrammatic view of position of the pancreas in the body. The site of the pancreas is shaded to show it is behind the stomach.

Fig. 6.—Liver and stomach cut away to show the pancreas.

Fig. 7. Pancreas cut to show its duct which carries the pancreatic digestive juice into the intestine.

symptoms quickly subside and disappear if the patient is given a little carbohydrate, such as the juice of an orange, a few teaspoonfuls of corn syrup or an equal quantity of sugar. Two lumps of sugar should always be carried by the patient.

Similar symptoms to those following an overdose of insulin occur with normal individuals after extreme exertion or when deprived of food. Along with those mentioned are nervous-

ness, weakness, faintness, double vision, dizziness and occasionally the person is irrational. I suspect that more often than we realize healthy people have a low blood-sugar percentage four or five hours after meals and in consequence behave as does a diabetic during an insulin reaction.

Insulin is a remedy which a patient can learn to administer to himself, but it is nevertheless true that it is primarily a

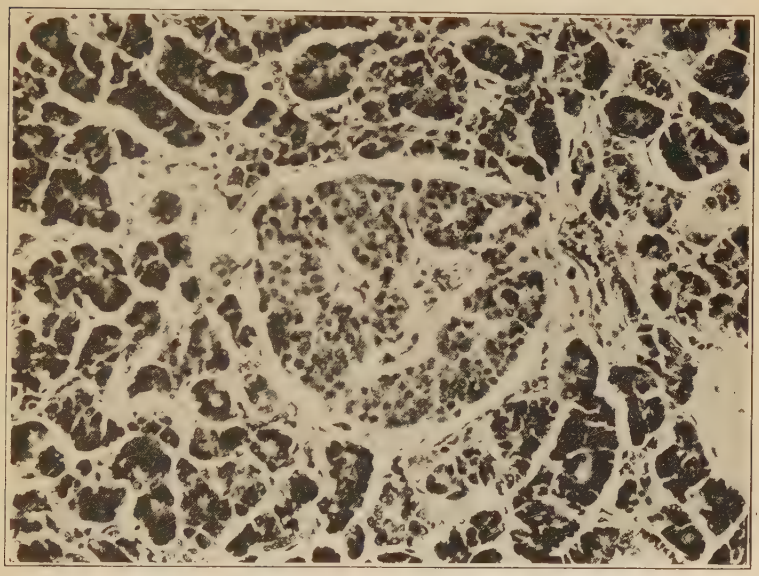


FIG. 8.—Normal island of Langerhans whose cells produce the insulin required by the body. × 250. (Mallory.)

remedy for the wise and not for the foolish, be they patients or doctors. Everyone knows it requires brains to live long with diabetes, but to use insulin successfully requires more brains.

Insulin is a comfort to doctor and patient. Insulin has revolutionized diabetic treatment in more ways than one. It has given the diabetic more food, strength and weight, but it has also carried to the doctor and to the patient a knowledge

and respect for the diabetic diet such as has never before existed. If the diabetic wishes to get his money's worth for the insulin he injects, he realizes that he must know what and how much to eat.

Good health, not tolerable health, is the right of the diabetic today and this is the real justification for the use of

Fig. 9. Marked degeneration of island of Langerhans with complete disappearance of the functioning cells. × 300. (Warren.)

insulin. When I think of what the diabetics were in the days of treatment with undernutrition (1914–1922) and what they are now with insulin, I am reminded of the words of the Prophet Ezekiel hundreds of years ago. No better description of the transformation which has taken place in the life of a diabetic patient can be found than in the account of his vision of the valley of dry bones. (See Ezekiel xxxvii, 1–10.)

CHAPTER IV.

QUESTIONS AND ANSWERS FOR DIABETIC PATIENTS.

Knowledge Essential for a Diabetic.—The treatment of a patient with diabetes lasts a long time. Treatment therefore should be so arranged that it can be continued with as little interference with the daily routine as is possible. Consequently, the patient must be taught the nature of his disease and how to conquer it.

In the following questions and answers an attempt is made to indicate the essential features of the knowledge desirable for a diabetic patient.

1. Question. Why does an untreated diabetic grow weak and thin?

Ans. He fails to get the full value of his food, because a part of it is lost as sugar in the urine. (See Fig. 43, page 158.)

2. Question. Why are untreated diabetics unusually hungry?

Ans. Because they must eat enough to sustain life and in addition enough to make up for the sugar lost in the urine (pages 156 to 159).

3. Question. Why are untreated diabetics abnormally thirsty?

Ans. Because they must drink sufficient liquids to produce enough urine to dissolve the sugar which is over-flowing through the kidneys.

4. Question. How much sugar is lost in the urine?

Ans. From a mere trace to 2 pounds in the twenty-four hours. (Fig. 43, page 158.) The percentage in the urine

seldom amounts to as much as 10 per cent, which is the percentage of sugar in an orange.

5. QUESTION. How can a diabetic gain weight and strength?

ANS. By eating those foods which do not readily change to sugar in the body and by the use of insulin.

6. QUESTION. What class of foods most easily causes sugar to appear in the urine?

ANS. Carbohydrate foods. These are sugar, starch and others which contain sugar and starch. Cane sugar is the commonest sugar. A pure form of starch is corn starch. Fruits are almost entirely water and sugar, and vegetables are largely water and starch. Bananas, when green, contain nearly 20 per cent starch, but when ripened this changes to sugar. Starchy foods during digestion in the body rapidly change to sugar, and consequently sugar and starch are nearly interchangeable. Potatoes are 20 per cent starch, and the flour out of which bread is made, being drier than the bread, contains about 70 per cent. Oatmeal is two-thirds starch, but other cereals contain rather more. Milk contains 5 per cent of sugar. Meat, fish, and eggs are entirely free from carbohydrate, save for an extremely small percentage of animal starch (glycogen) to be found in liver. The quantity of carbohydrate in various foods is shown in Table 2, page 47, and also in Table 3, page 48.

7. QUESTION. What other type of food may change to sugar and appear in the urine?

ANS. Protein. Theoretically 58 per cent may undergo this change. Protein is the food from which muscles and tissues are made. It is therefore an essential constituent of the diet. Examples of protein are lean of meat or fish, curd of milk, and white of egg. The yolk contains just as much protein as the white, but it is mixed with fat. Protein is also found in grains, and there is considerable in beans and peas, but very little in other vegetables, and almost none in fruits.

8. QUESTION. What kind of food is least apt to change to sugar?

ANS. Fat.

Examples of fat in pure form are olive oil and lard. Butter and substitutes for it contain 85 per cent fat. Rich cream contains about 40 per cent fat, whereas milk may contain but 3 per cent. Common cheese is one-third fat. The percentage of fat in meat varies from that in fat bacon, in which the percentage occasionally rises to 80 per cent, to chicken, in which the percentage of fat is 3 per cent or less. In codfish and haddock the amount of fat is negligible, but in salmon it reaches 13 per cent. Nuts are rich in fat. Fat and carbohydrate are to a large extent interchangeable. In northern climates fat forms a large part of the diet, while in the tropics it is replaced by carbohydrate.

9. QUESTION. Why then does a diabetic not live upon fat alone?

ANS. (*a*) He would tire of it. (*b*) Fat does not contain nitrogen and so would not replace the tissues of the body. (*c*) If fat is taken without some carbohydrate, acid poisoning (acidosis) develops and unless treated this leads to coma and death.

10. QUESTION. What is the proof that the diabetic does not make normal use of the carbohydrate eaten?

ANS. The appearance of sugar in the urine.

11. QUESTION. How is the urine tested for sugar?

ANS. In many ways. The Benedict test is one of the most reliable (page 242).

12. QUESTION. What then are the sources of sugar in the urine?

ANS. First, the carbohydrate in the diet; second the protein; third, the fat. From 100 grams of carbohydrate approximately 100 grams of sugar can be formed. From 100 grams of protein it is theoretically possible to form 58 grams of sugar, and from 100 grams of fat, 10 grams of sugar.

In diabetes sugar may appear in the urine irrespective of the diet because the body may consume the protein and fat of which it is itself composed. Moreover, whenever the total diet is in excess, irrespective of any particular food, the power of the body to assimilate carbohydrate lessens. Hence the danger to the diabetic in overfeeding.

13. QUESTION. Is sugar present in the blood of healthy people?

ANS. Yes. It amounts to about 0.1 per cent normally if the blood is examined before breakfast. After a meal the percentage increases to about 0.14 per cent, but drops to normal within approximately two hours. If it rises above 0.16 per cent in the blood after a meal, sugar appears in the urine. (See Fig. 19, page 57.)

14. QUESTION. Why is the blood tested for sugar if the urine is known to be sugar-free?

ANS. To determine whether the diet should be increased. The results of a faulty diet can be detected earlier in the blood than in the urine. The diet should not be increased, as a rule, unless the blood sugar is normal. In certain rare cases the sugar in the blood is normal and yet sugar is present in the urine. These are not true cases of diabetes, but are known as examples of renal glycosuria. In exceptional cases the sugar in the blood may rise above 0.16 per cent without any sugar in the urine.

15. QUESTION. How does the diabetic diet differ from the normal diet?

ANS. By the smaller quantity of carbohydrate, and the greater quantity of fat. (Tables 10, 11, pages 75, 76 and Figs. 26, 27, pages 77, 78.)

16. QUESTION. How much food does a diabetic patient need?

ANS. About 20 to 30 Calories per kilogram body weight or 10 to 14 Calories per pound. This is a little less than for the ordinary individual.

17. QUESTION. What is a Calorie?

ANS. A Calorie is a unit of heat. It represents the amount of heat which is required to raise 1 kilogram of water 1 degree Centigrade, or approximately 1 pound of water 4 degrees Fahrenheit.

18. QUESTION. How many calories are produced in the body by the utilization or oxidation of 1 gram of carbohydrate, protein and fat?

ANS. One gram carbohydrate produces 4 Calories; 1 gram protein produces 4 Calories; 1 gram fat produces 9 Calories; 1 gram alcohol produces 7 Calories.

19. QUESTION. How is the treatment of diabetes begun and sugar removed from the urine, or, in other words, how is the patient made sugar-free?

ANS. In mild cases by eating less and exercising more, with a consequent loss of weight, in moderate cases by still greater reduction in the total diet with especial decrease in carbohydrate, and in severe cases by the measures already described and in addition the reduction of the protein to a very small quantity.

20. QUESTION. When the urine of the patient is sugar-free, what is done next?

ANS. The diet is gradually increased, slightly in carbohydrate and protein, liberally in fat, meanwhile testing the urine daily to determine whether the total quantity of food and the different varieties of it are tolerated without the return of sugar in the urine or excess of sugar in the blood.

21. QUESTION. How does insulin help?

ANS. Insulin allows the patient to eat more food. Insulin enables the patient to get the benefit of the carbohydrate which he eats. One unit of insulin "burns up" 1 to 2 grams of carbohydrate. If a patient utilizes carbohydrate, the danger of acidosis (diabetic coma) largely disappears. Without insulin the diet must be very much restricted in order to keep the urine of the patient free from sugar.

22. Question. What is the dose of insulin?

Ans. It varies with the case. A patient requires as many units as necessary to enable him to secure enough food to maintain vigor and a reasonable body weight.

23. Question. Must insulin be continued indefinitely?

Ans. Not in the milder cases. In many instances it may be reduced in quantity.

24. Question. What are the chief dangers in the use of insulin?

Ans. There are two dangers.

(*a*) A "reaction" occurs and the blood sugar falls below normal, if too much insulin is given. A reaction is manifested by hunger, tremor, sweating, unconsciousness. Other symptoms are weakness, pallor, faintness, nervousness, dizziness, dilated pupils, double vision, emotional upsets. The urine is free from sugar. These symptoms disappear if a little carbohydrate, such as the juice of an orange, 2 or 3 lumps of sugar, are taken.

The cause of an insulin reaction is the lack of sugar in the blood upon which insulin can act. It may occur: (1) if the dose of insulin is not followed soon (*a*) by food, (*b*) or by food containing enough carbohydrate, (*c*) if the digestion is upset and the food not absorbed, vomited or lost by diarrhea; (2) as a result of unusual exercise, because exercise lowers the blood sugar; (3) finally diabetics improve and a reaction may simply signify that they no longer require so much insulin.

(*b*) It is dangerous to omit insulin if sugar is present in the urine. If this rule is not followed, diabetic coma might ensue. Even if the patient ceases to take food, he should continue the insulin in smaller and more frequent doses as long as the urine is not sugar-free. If deprived of insulin cut the diet in half. But never be like one of the foolish virgins. Keep a reserve of insulin, needles and syringes on hand.

25. QUESTION. What can a diabetic patient do for himself besides keeping the urine sugar-free?

ANS. Be cheerful and also be thankful that his disease instead of being of a hopeless character is one which his brains will help him to conquer. He can keep his temper under control and his skin, teeth and feet scrupulously clean. He should avoid people with colds in the head and sore throats; secure a daily action of the bowels; sleep nine or more hours at night and invariably take at least one-half hour off for rest of some description during the day; exercise moderately in the forenoon, afternoon and evening.

26. QUESTION. How can you help to prevent the development of diabetes in your children and friends?

ANS. By explaining to them the dangers of obesity and telling them of easy ways by which to escape it: such as,

1. To leave the table a little hungry, avoiding second helpings.
2. To satisfy the stomach with non-nourishing 5 per cent vegetables instead of with bread and butter, which are fattening.
3. To omit lunches and candy and sodas between meals.
4. To use skimmed milk instead of cream.
5. To encourage exercise, abundant sleep, and energetic, yet restful, vacations.

27. QUESTION. How can acid poisoning be prevented?

ANS. By keeping the urine sugar-free.

Acid poisoning never occurs unless a patient overeats. He may overeat by breaking the diet and overeating food, or he may overeat by eating his own body which is what takes place if he has fever and infections or certain forms of goiter. Acid poisoning is so dangerous that whenever a patient feels ill and is in doubt about having acid poisoning he had better consider it to be present. He should immediately:

1. Call his doctor.
2. Go to bed.
3. Drink slowly a cupful of hot liquid every hour, either hot water, tea, coffee, clear thin broth, or water-oatmeal gruel or orange juice.

4. Keep warm.
5. Move the bowels by injection. If nauseated, take liquid by enema in the form of salt solution. A level teaspoonful of salt is to be added to 1 pint of luke-warm water. If this is injected very slowly into the rectum after the cleansing enema, it will be retained and absorbed.
6. Procure a nurse, or someone to act as nurse. Thereby the patient is relieved of all responsibility and work in carrying out the above treatment.

28. QUESTION. Can a diabetic be operated upon?

ANS. Yes. As a rule about 20 grams of carbohydrate are given three hours before the operation, preceded by the patient's usual dose of insulin. After the operation insulin is given every three hours if sugar appears in the urine, but one should not expect the sugar to disappear immediately in all cases, particularly those with infections. The newer anesthetics such as ethylene and gas-oxygen or spinal anesthesia are safer than ether, but even that is safe if glycogen is stored in the liver by the administration of insulin and carbohydrate a few hours before the operative procedure.

A diabetic patient at the beginning of treatment should be made to understand that he is taking a course in diabetes.

For successful graduation in the course he should demonstrate his ability:

1. To test the urine for sugar (page 241).
2. To serve himself with approximate accuracy, without scales, 150 grams of a 5 per cent vegetable (pages 45 to 48).
3. To record a summary of his diet for the previous day (Table 4, page 50).
4. To explain the quantity of carbohydrate which it contains (pages 42 to 53).
5. To describe what he is to do if sugar returns in the urine (pages 107 to 110).
6. To describe what he is to do if he has reason to believe that he is threatened with acid poisoning (pages 39 and 40, also pages 119 to 124).

7. To know what to eat while traveling if his usual diet is not available. See page 173.
8. To give insulin to himself and to know when to give it.
9. To state the dangers of (*a*) too much insulin, and (*b*) of its total omission (page 38).
10. To care for his feet in order to avoid blood poisoning and gangrene which are fatal to so many diabetics (page 130).

FIG. 10.—Case No. 5036. Age at onset eight years and eight months; duration to February, 1929, 3.2 years. When Richard began diabetes, his mother worried just as much as the mother in the picture. Recent diet, carbohydrate 147 grams, protein 78 grams, fat 101 grams. Insulin 20-0-20 units.

CHAPTER V.

DIABETIC ARITHMETIC.

It is far simpler in computations of the diet to use the metric than the avoirdupois system. Unfortunately, the more general employment of scales registering pounds and ounces makes this at times difficult. For this reason it is well to know both the metric and avoirdupois systems and to be able to convert the one into the other. The essential values are given in Table 1.

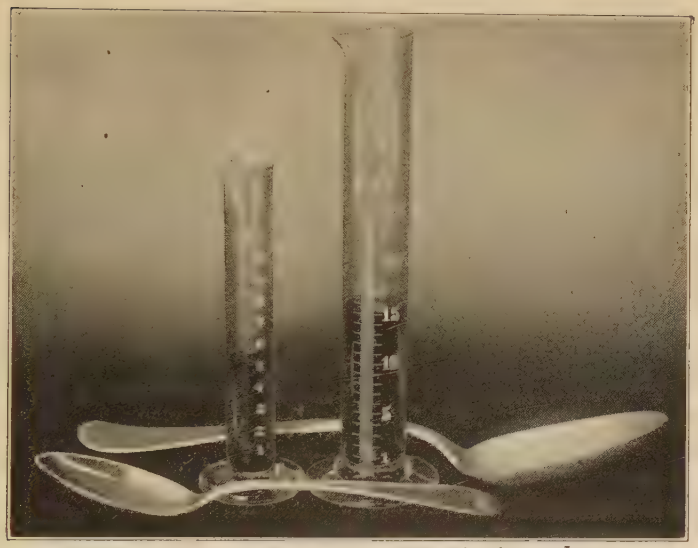
Table 1.—The Metric and Avoirdupois Systems Compared.

DRY MEASURE.			
30 grams	= 1 ounce[1]	: 16 ounces	= 1.0 pound
1000 grams	= 1 kilogram	:	= 2.2 pounds
LIQUID MEASURE.			
30 cubic centimeters	= 1 fluidounce[2]	: 32 ounces	= 1 quart
1000 cubic centimeters	= 1 liter		
CALORIES.			
1 gram carbohydrate	= 4 Calories		
1 gram protein	= 4 Calories		
1 gram fat	= 9 Calories		

The unit of weight in the metric system is a gram. It is easy to visualize the value of a gram when it is known that a buffalo nickel, five-cent coin, weighs exactly 5 grams, a shredded wheat biscuit weighs 30 grams, and so do three large portions of butter or six of the large lumps of sugar. The average egg weighs 60 grams and a banana (peeled) 100 grams. A kilogram is equivalent to 2.2 pounds. Kilograms become more homelike when one's own weight is changed into kilograms. Thus a weight of 132 pounds avoirdupois is 60 kilograms metric.

[1] Actually 28.4 grams.

[2] Actually 29.6 grams.



a *b*

FIG. 11.—*a*, teaspoon, capacity 5 cubic centimeters (cc.); *b*, tablespoon, capacity 15 cubic centimeters (cc.) or $\frac{1}{2}$ ounce.

a *b* *c* *d*

FIG. 12.—*a*, cream, $\frac{1}{2}$ pint or 240 cubic centimeters (cc.); *b*, drinking glass, capacity 8 ounces; *c*, 250 cubic centimeters (cc.) graduate, contains $\frac{1}{2}$ pint fluid; *d*, measuring cup, capacity 8 ounces.

The unit of volume in liquid measure in the metric system is the cubic centimeter. A cubic centimeter of water weighs 1 gram. Thirty cubic centimeters make a fluidounce, which

FIG. 13

Butter, 10 grams Fat, 8 grams | Shredded wheat, 30 grams Carbohydrate, 23 grams | Uneeda Biscuit, 6 grams Carbohydrate, 5 grams

Three 10-gram weights.

FIG. 14

5-gram weight | Lump sugar, 5 grams | 5 oyster crackers, 5 grams

Buffalo 5-cent piece, 5 grams

is approximately equal to 2 tablespoonfuls of water. One thousand cubic centimeters are a little more than a quart.

In estimating carbohydrate, protein and fat in the diet, or

sugar in the urine, enough accuracy is obtained in clinical work by considering that 30 grams (gm.) or 30 cubic centimeters (cc.) equal an ounce, dry or fluid measure.

The foods upon which diabetic patients live are nearly all printed in Tables 2 and 3 and are shown in Fig. 27 page 78 as well. Most of the foods in Table 2 come under the head of 5 per cent vegetables. By this is meant that not over

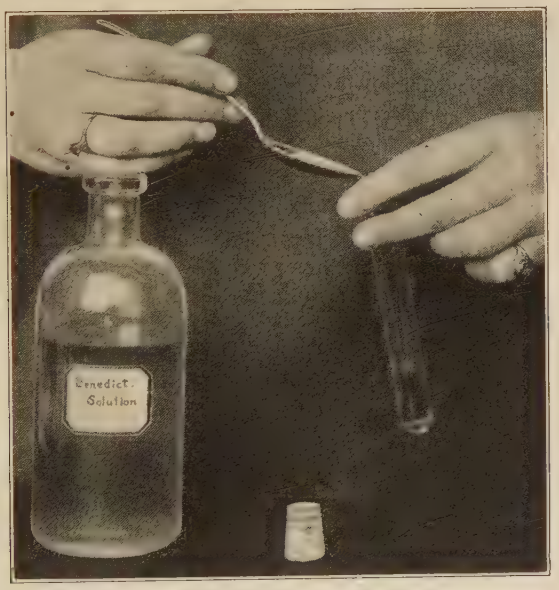


FIG. 15.—One teaspoonful (5 cubic centimeters (cc.)) of Benedict's solution in a test-tube.

5 per cent (or 5 grams in each 100 grams) of these vegetables may be counted as carbohydrate. As a matter of fact, lettuce, at the beginning of the first column, contains 2.2 per cent, and string beans, toward the bottom of the second column, occasionally contain as much as 6 per cent carbohydrate. The average percentage of carbohydrate for the entire group would be about 3 per cent, or 1 gram carbohydrate for each (1 ounce) 30 grams of vegetables. A large saucerful of

a 5 per cent vegetable weighs about 150 grams and contains about 5 grams of carbohydrate. Another reason for reckon-

2. A teaspoonful of sugar.
3. A lump of sugar.
FIVE CENTS
A Buffalo nickel weighs 5 grams
1 An Uneeda biscuit.
4. One-half a small orange.
5. A portion of lettuce or a saucer of a 5 per cent vegetable.
6. One-fourth of a banana.

FIG. 16.—A buffalo nickel and its equivalents by weight in carbohydrate.

ing these vegetables at 3 per cent available carbohydrate is that when they are cooked considerable carbohydrate is lost

in the water used in the cooking. This also applies to vegetables in the 10 per cent column, and these vegetables are reckoned as containing 6 per cent carbohydrate or 2 grams to the ounce. In the 15 per cent and the 20 per cent vegetables about their full value is available. Fruit, also, must

TABLE 2.—FOODS ARRANGED APPROXIMATELY ACCORDING TO CONTENT OF CARBOHYDRATE.

Vegetables (fresh or canned).

5 per cent.[1]		10 per cent.[1]	15 per cent.[1]	20 per cent.[1]
2-3 per cent.	3–5 per cent.			
Lettuce	Tomatoes	String beans	Green peas	Potatoes
Cucumbers	Brussels	Pumpkin	Artichokes	Shell beans
Spinach	sprouts	Turnips	(Jerusalem)	Baked beans
Asparagus	Water cress	Kohl-rabi	Parsnips	Green corn
Rhubarb	Sea kale	Squash	Lima beans	Boiled rice
Endive	Okra	Beets	(very young)	Boiled
Marrow	Cauliflower	Carrots		macaroni
Sorrel	Egg plant	Onions		
Sauerkraut	Cabbage	Green peas		
Beet greens	Radishes	(very young)		
Dandelions	Leeks			
Swiss chard	String beans			
Celery	(very young)			
Mushrooms	Broccoli			
	Artichokes			
	Globe			
		Fruits.		
Ripe olives (20 per cent fat)		Strawberries	Raspberries	Plums
Grapefruit		Lemons	Currants	Bananas
		Cranberries	Apricots	Prunes
		Peaches	Pears	
		Pineapple	Apples	
		Blackberries	Blueberries	
		Oranges	Cherries	

[1] Reckon average carbohydrate in 5 per cent vegetables as 3 per cent; of 10 per cent as 6 per cent.

be reckoned as containing the full quantity of carbohydrate assigned to it in the column in which it occurs. Patients seldom need to know the food values of more than the 19 foods mentioned in Table 3. Patients are advised to buy gram scales, but since many households already have ounce scales, Table 3 is so arranged that the quantities of carbo-

hydrate, protein, and fat in an ounce (30 grams) of food are placed opposite that food. There are a few exceptions. The values for two Uneedas, 6 oysters, and 1 egg are given instead of for 30 grams of these foods. In Chapter XXVI are given the actual percentage values for carbohydrate, protein, and fat in all foods.

TABLE 3.—THE QUANTITY OF CARBOHYDRATE, PROTEIN AND FAT AND THE CALORIC VALUE OF 30 GRAMS (1 OUNCE) OF FOODS IN COMMON USE.

30 grams (1 ounce) containing approximately.	Carbohydrate, gm.	Protein, gm.	Fat, gm.	Calories.
Vegetables, 5 per cent	1.0	0.5	0	6
Vegetables, 10 per cent	2.0	0.5	0	10
Shredded wheat	23.0	3.0	0	104
Uneedas, 2	10.0	1.0	1	53
Potato	6.0	1.0	0	28
Bread	18.0	3.0	0	84
Oatmeal, dry weight	20.0	5.0	2	118
Oysters, 6	4.0	6.0	1	49
Milk	1.5	1.0	1	19
Meat (cooked, lean)	0.0	8.0	5	77
Fish (fat-free varieties)	0.0	6.0	0	24
Chicken (cooked, lean)	0.0	8.0	3	59
Egg, 1	0.0	6.0	6	78
Cheese	0.0	8.0	11	131
Bacon	0.0	5.0	15	155
Cream, 20 per cent	1.0	1.0	6	62
Cream, 40 per cent	1.0	1.0	12	116
Butter	0.0	0.0	25	225
Oil	0.0	0.0	30	270

The reason for inserting the food value of dry oatmeal instead of cooked oatmeal is due to the variable quantity of water which it takes up during cooking. There is far less difference in the weights of preparations of dry oatmeal.

The division of the diet of a patient weighing 121 pounds ($121 \div 2.2 = 55$ kilograms) is given in Table 4, p. 50. In the first column of the table is recorded a list of the different foods taken during the day. Three hundred grams, or 10 ounces, 2 saucerfuls, of 5 per cent vegetables were given for dinner and 300 grams for supper, making a total for the day of 600 grams. Half a grape fruit, 100 grams, was given at breakfast. A small orange was given at noon and a medium sized orange at night. Oatmeal, 30 grams dry weight, (240

grams cooked), 1 saucerful, was given at breakfast. Two Uneeda biscuits were given at noon and night. One egg was given at breakfast and another at supper. The cream, 240 cc., $\frac{1}{2}$ pint, 8 ounces, for the day, was divided between the

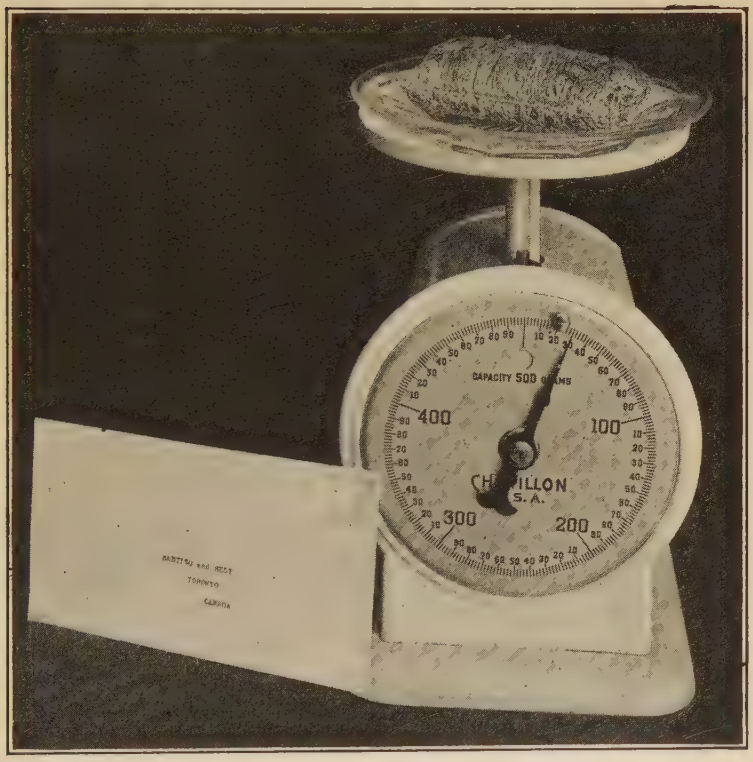


FIG. 17.—Food scales weighing 500 grams.[1] The pointer is at 30 grams which is the equivalent of 1 ounce. This is the weight of the shredded wheat shown on the scale pan.

three meals. Fifteen grams of bacon, 2 strips, were allowed at breakfast and also at supper. The butter was given in

[1] Convenient food scales of 500 grams' capacity with movable dial are made by John Chatillon & Sons, 89 Cliff Street, New York City.

15-gram portions, ½ ounce, a large portion, at noon and night, and the meat was given at dinner.

TABLE 4.—SUMMARY AND COMPUTATION OF A DAY'S DIET AND CALCULATIONS BASED ON TABLES 2 AND 3.

NAME. DATE

Food.	Breakfast	Dinner	Supper	Total grams	Carbohydrates.	Protein.	Fat.
5% vegetables	.....	300	300	600	20	10	0
10% vegetables	.....	.....	.....	.....	.....	.....	0
Orange	.....	100	150	250	25	0	0
Grapefruit	100	.....	.....	100	5	0	0
Banana	.....	.....	.....	.....	.....	0	0
Oatmeal	30	.....	.....	.....	20	5	2
Shredded Wheat	.....	.....	.....	.....	.....	.....	.....
Uneeda	.....	2	2	4	20	2	2
Bread	.....	.....	.....	.....	.....	.....	.....
Potato	.....	.....	.....	.....	.....	.....	.....
Egg	1	.....	1	2	.....	12	12
Cream, 20%	120	60	60	240	8	8	48
Bacon	15	.....	15	30	0	5	15
Butter	.....	15	15	30	0	0	25
Meat	.....	60	.....	60	0	16	10
Carbohydrates	29	32	37	Grams	98	58	114
Protein	18	24	16	Calories			
Fat	40	36	38	per gram	4	4	9
			Total Calories = 1650		392	232	1026

An ounce is the maximum weight of a letter, which the United States Government will deliver for two cents.

Knowing the total quantity of each variety of food eaten by the patient during the day, by using the table of food values (Table 3) one can determine the amount of carbohydrate, protein and fat for each given food. Thus, 600 grams of 5 per cent vegetables were used. Table 3 shows that for each 30 grams (1 ounce) of 5 per cent vegetables there is 1 gram[1] carbohydrate and 0.5 gram protein, and therefore in 600 grams (20 ounces) there would be 20 grams carbohydrate and half as many grams protein, or 10 grams.

Adult weight (naked), 121 pounds, or $\left(\frac{121}{2.2}\right)$ 55 kilograms.

Carbohydrate,	98 grams × 4 =	392 Calories.	
Protein,	58 grams × 4 =	232 "	(1 gram protein per kilo-
Fat,	114 grams × 9 =	1026 "	gram body weight.)
	Total	1650 "	

1650 Calories ÷ 55 kilograms = 30 Calories per kilogram body weight.

Oranges are not recorded in Table 3 but are to be reckoned as containing 10 per cent carbohydrate and grapefruit as 5 per cent carbohydrate. The 30 grams of oatmeal, dry weight, contained, according to Table 3, carbohydrate, 20 grams, protein, 5 grams and fat, 2 grams; the 4 Uneeda biscuits carbohydrate, 20 grams, protein, 2 grams, fat, 2 grams.

Two eggs were given. Table 3 shows that the eggs contain no carbohydrate, but that each egg contains 6 grams protein and 6 grams fat—in other words, 2 eggs contain 12 grams protein and 12 grams fat. In the same way one can reckon the amount of carbohydrate, protein and fat in 240 grams (cubic centimeters) of 20 per cent cream (*i. e.*, cream containing 20 per cent butter fat), 30 grams of bacon, 30 grams of butter, and 60 grams of meat (cooked).

The actual percentages of carbohydrate, protein, and fat in various other foods are given in the large tables on pages 204 238. From these it is easy to calculate the quantity of carbo-

[1] Arithmetically, 1.5 grams, but on account of variations of carbohydrate in vegetables of the 5 per cent group, and on account of losses by cooking, as well as for convenience, reckoned as 1 gram.

hydrate, protein and fat in any food which a patient takes when the total quantity of food eaten is known. Patients and nurses are repeatedly confused by such tables, forgetting that if the quantity of carbohydrate in milk is 5 per cent, 100 grams of milk (or in this case cubic centimeters) would contain 5 grams of carbohydrate, just as 5 per cent interest on $100 for a year would be $5. Lobster, for instance, contains 16 per cent protein. and therefore 100 grams of lobster contain (100 × 0.16) 16 grams protein.

One should be familiar with percentages, because in this way one can often find the values of various foods which are not contained in the 30-gram (1 ounce) table. Should a patient, for example, wish to substitute his 8 grams of protein in the form of 30 grams of meat for 8 grams protein in the form of lobster, this could be done by taking $\left(\frac{8}{0.16}\right) = 50$ grams of lobster which contain 16 per cent protein.

TABLE 5.—ILLUSTRATION OF AMBULATORY TREATMENT WITHOUT FASTING OR OMISSION OF PROTEIN. CASE NO. 1237. AGE AT ONSET IN SEPTEMBER, 1915, THIRTY-NINE YEARS AND FIVE MONTHS.

Date, 1917.	Urine.				Diet in grams.				Weight, pounds, dressed.	Dietary prescriptions in grams.							
	Volume, c.c.	Diacetic acid.	Sugar.		Carbohydrate.	Protein.	Fat.	Calories.		Vegetables, 5 per cent.	Fish.	Orange.	Meat.	No. of eggs.	Bacon.	Butter.	Cream, 20 per cent.
			Per cent.	Total gms.													
Feb. 17	4000	0	8.4	336													
19	1500	0	2.2	33	54	84	0	....	...	720	360	300					
20	1500	0	1.8	27	54	84	0	....	...	720	360	300					
21	1250	0	1.8	23	39	84	0	....	142	720	360	150					
22	1500	0	0.4	6	24	84	0	432	...	720	360	0					
23	1250	0	0.2	3	24	84	0	432	...	720	360	0					
24	1500	0	Tr.	0	24	84	0	432	...	720	360	0					
25	1500	0	Tr.	0	24	84	15	567	139	720	240	0	90				
26	....	0	0	0	24	84	39	783	...	720	120	0	90	4			
27	1250	0	0	0	24	82	57	937	...	720	120	0	90	2	60		
Mar. 1	....	0	0	0	24	82	82	1162	...	720	120	0	90	2	60	30	
3	....	0	0	0	26	84	94	1286	138	720	120	0	90	2	60	30	60
6	....	0	0	0	32	85	106	1422	...	720	120	50	90	2	60	30	90
9	....	0	0	0	42	85	106	1462	136	720	120	150	90	2	60	30	90
13	....	0	0	0	54	87	168	2076									

The use of percentages, however, is employed far more in determining the quantity of sugar voided in the urine by

diabetic patients during the twenty-four hours. If an individual voids 2000 cc. (cubic centimeters) of urine and the percentage of sugar is 5 per cent, it is plain that the quantity of sugar lost in the urine during the twenty-four hours would be $2000 \times 0.05 = 100$ grams. As a lump of sugar amounts to about 5 grams, this would mean that the equivalent of 20 lumps of sugar was lost in the urine in one day.

It is interesting to compare the decrease of sugar in the urine with the reduction of carbohydrate in the diet.

This is shown in Table 5, which is far more simple than it appears to be at the first glance. Incidentally the table illustrates the excellent results obtained by dietetic treatment without the aid of insulin. The time required was nearly a month, whereas with insulin the same result could be obtained in a week or ten days.

FIG. 18.—Case No. 2560. Age at onset five years, eleven months. Duration to December, 1928, seven years, six months. Recent diet, carbohydrate, 124; protein, 62; fat 125. Insulin 12–0–10.

CHAPTER VI.

EFFICIENCY IN VISITS TO A DOCTOR.

A PATIENT frequently fails to get the benefit he should derive from a visit to his physician because he does not furnish the facts upon which advice for further treatment can be based. Physical appearance alone is by no means a sufficient guide to the careful doctor. Information must be presented concerning the urine, the diet, units of insulin taken, and often concerning the blood. The efficient coöperation of the patient is necessary.

1. **Information Obtained by Examination of the Urine.**—The physician should know whether the urine of the patient is free from sugar, or, if present, how much it contains. This is essential in order to prescribe the diet for the following days. The patient should therefore take with him a specimen of the urine saved from the entire twenty-four-hour amount. To collect such a specimen of urine, discard that voided at 7 A.M. and then save all urine passed up to and including that obtained at 7 the next morning. Take 120 cc. (4 ounces) of the thoroughly mixed twenty-four-hour quantity for examination. Record the twenty-four-hour amount of urine, the date, and the name on the bottle. The bottle in which the urine is being collected should be kept in a cool place. It is best to procure a bottle[1] for this special purpose sufficiently large to hold the entire twenty-four-hour amount of urine. Select a bottle with a large mouth, that it may be more easily cleansed. The bottle should be scalded out daily. It should have a tight-fitting cork. Urine so collected decomposes slowly. On account of the presence of sugar, diabetic urines are prone to ferment, and if fermentation occurs, a portion

[1] Bottles known to the druggists as percolator bottles and graduated in 100 cc. up to 2000 cc. are most convenient.

of the sugar disappears and invalidates any subsequent test for the quantity of sugar which the urine may have contained when voided. A good preservative is xylol of which ½ teaspoonful can be placed in a 2-quart bottle before the collection of urine begins.

From the difference between the total quantity of sugar in the urine and the carbohydrate in the diet it is possible to learn how much of the carbohydrate of the diet has been assimilated by the body and how much has been lost in the urine. Mild cases of diabetes may consume in the food 100 grams of carbohydrate and lose only 10 grams in the urine; moderately severe cases may excrete five times this quantity, and very severe cases will excrete not only the full amount of carbohydrate eaten, but, in addition, sugar which they have formed from protein and fat.

The use of insulin has emphasized the value of the examination of single specimens of urine. The urine voided before a meal may be free from sugar, while that voided one or two hours after eating may show sugar. This indicates that either the carbohydrate should be reduced at that particular meal or the insulin increased before it. The desirability of saving the day's urine in four portions, forenoon, afternoon, evening, night, is therefore obvious.

2. **Information Obtained by Examination of the Diet.**—The quality and quantity of the food eaten during the twenty-four hours should be recorded. If thirty minutes are allowed for a visit to the physician's office, it is no exaggeration to say that unless this summary of the diet is kept, one-third to one-half of the visit is spent by the physician in learning what the patient has eaten. For this reason patients should always bring a diet list arranged according to some such plan as that shown in Table 4 (page 50) or on page 58.

Even if the quantities of carbohydrate, protein, fat and calories are not worked out by the patient, the grouping together of 5 per cent vegetables, the day's summary of the total quantity of butter, cream, meat, eggs, vegetables, oatmeal and fruit, rather than the hit-or-miss record of the amount taken at each meal, saves an enormous amount of time which can be employed far better by the physician in

giving helpful advice. In other words the patient should go to the physician with questions to be answered and for treatment rather than for a lesson in grammar-school arithmetic.

3. **Insulin.**—An accurate record of the amount of insulin taken should be furnished. From what has been said about the fleeting appearance of sugar in the urine after meals, it is important to know how many units of insulin have been employed during the day, the number of doses, before what meals, and how many minutes before a meal. Information of this character helps enormously in the decision as to the future diet and a possible rearrangement of the methods of insulin medication.

4. **Information Obtained by Examination of the Blood.**—Frequently the course of treatment of a case of diabetes is regulated by the quantity of sugar in the blood. If the sugar in the blood can be kept at the normal figure before a meal, 0.1 per cent, and at not over 0.16 per cent after a meal, the patient should not show sugar in the urine. It is advantageous to make the blood-sugar tests before breakfast and after eating. The blood sugar usually reaches its greatest height in normals about one-half hour after a meal, but in diabetics the peak comes later and the curve falls more slowly to the normal level. The percentage of sugar in the blood usually reaches its lowest limit in the late forenoon. This is the period when the patient taking insulin is most exposed to an insulin reaction and consequently an important hour for a blood-sugar test. This is a particularly important hour for the test for patients who are about to leave the hospital and for all patients who present any hints of an overdose of insulin. (See Figs. 19, 20, page 57.)

5. **Body Weight.**—If the patient has scales, the weight fasting, and preferably undressed, on the morning of the visit should be taken.

6. **Notebook.**—The patient should start a notebook on the first day of treatment and show it to his physician at each visit. All questions about symptoms and diet which have arisen since the former visit should be set down neatly with space left for an answer to each question. It is a common

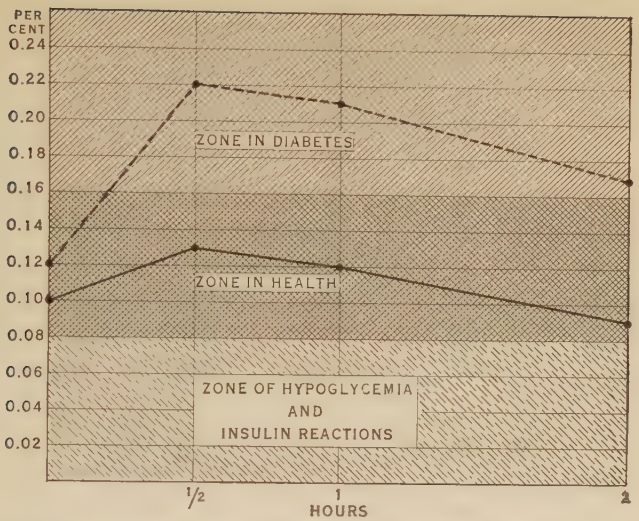


FIG. 19.—Blood sugar zones: in health; in diabetes, during an insulin reaction.

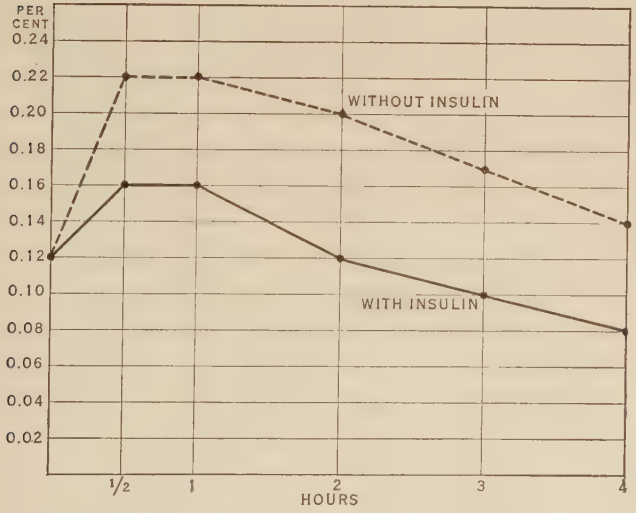


FIG. 20.—The blood sugar in diabetes before and after a meal, with and without insulin.

TABLE 6.—COURSE OF A DIABETIC PATIENT DURING FIFTEEN YEARS.

(Case No. 632. Age at onset, thirty years in 1912.)

Date.	Sugar, per cent.	Diet in grams.				Naked weight.	5 per cent vegetables, gm.	10 per cent vegetables, gm.	10 per cent fruit, gm.	Uneeda.	Oatmeal, gm.	Artichokes, gm.	Eggs.	Meat, gm.	Bacon, gm.	Butter, gm.	Cream, 20 per cent, cc.	Insulin, units.
		Carbohydrate.	Protein.	Fat.	Calories.													
1913.																		
Aug. 12	1.3	...	...	...	...	144												
13	0	15																
14	0.4	15																
15	0.2	15																
16	0.4	15																
17	0	15																
18	0.6	15																
19	0.6	15	...	...	...	145												
1922.																		
Dec. 19	0.1	43	75	147	1795	110	510		130				4	90	45	45	240	〃
22	0	43	75	147	1795		510		130				4	90	45	45	240	〃
23	Tr.	43	75	147	1795		510		130				4	90	45	45	240	〃
26	0	43	75	147	1795	111	510		130				4	90	45	45	240	〃
1928.																		
Dec. 21	0	149	69	116	1916	129¾	240	120	470	5		160	4	90	30	20	210	26
22	Tr.	145	71	116	1908		480	...	730	5		160	4	90	30	40	210	26
1929.																		
Jan. 20	Tr.	171	72	119	2043		480		*590	5		240	4	90	30	20	130	26
24	0	172	69	116	2008		240	120	840	5		240	4	90	30	20	210	26
1929.																		
Feb.	0	155	69	117	1949	130	240	120	710	5		240	4	90	30	40	210	26

* 150 grams of ice cream additional on this day.

error for patients to ask the same question many times, whereas if the answer is written down by the physician the question would thus be answered once for all time. Furthermore, it is a great advantage for a patient to keep a notebook, because gradually it becomes valuable for reference, and his whole plan of treatment is systematized.

The notebook should contain a statement as to whether sugar has been present or absent in the urine since the last report to the physician. Such data can be gathered on one page and again thus save time. When a patient comes to my office with a single specimen of urine instead of a portion taken from the twenty-four-hour quantity, without any record of the food eaten during the preceding day, and starts in to recount that he had nothing but eggs, meat, and fish, then later remembers that he had a little cream and various vegetables, then with prompting recalls butter and an orange and a little oatmeal, I always pity him, and on very exceptional occasions am able to recall with satisfaction after the interview Solomon's soliloquy in Proverbs xvi, verse 32.

The diet of Case No. 632 is given in Table 6 for the period in 1913 when I first saw him, in 1922 when he began insulin, and now after he has taken it for six years. Note the increase in carbohydrate. In 1913 I estimated carbohydrate, but guessed at protein and fat. For more about this patient who continues to improve, see p. 115.

CHAPTER VII.

HYGIENE FOR THE DIABETIC.

Any agency which promotes physical or mental hygiene is a step toward the prevention of diabetes in the predisposed and the abatement of its severity in those who have acquired it. The modern diabetic diet and insulin make unnecessary the erstwhile sound advice that diabetics "should be kept mentally indolent and physically active." Nevertheless, patients should remember they are not absolutely well and should allow for this by taking more relaxation each day and more vacations each year than their friends. There are as few diabetics who are restricted to one-fifth of a day's work as there are those who ought to attempt over four-fifths of a day's work.

Exercise.—Dr. Sabine, of Brookline, made the remark, based upon the experience of his many years of general practice, that those of his patients who took active camping trips in the woods bore the stress of modern life best. By this means exercise was combined with mental relaxation. That the good effects of each last for months is not hard to believe. It is only natural to conclude that if the muscles, in which is stored one-half of the carbohydrate of the body, are kept in good condition by training, a favorable effect must be produced upon the general metabolism of carbohydrate. Pedometers are to be encouraged. It is better to discuss how far you have walked than the food you have eaten. The effect of increase of exercise upon the well-being of fat diabetics has been pronounced, and it is striking how many miles a semi-ill or obese diabetic patient can learn to walk in two weeks. The patients are encouraged to take their walks soon after meals and to go outdoors several times a day. The good effects of exercise are shown not only by the freedom of the urine from sugar and an increased carbo-

hydrate tolerance, but by improved circulation and general well-being. No case should be considered too far advanced for an attempt at muscular redevelopment. Patients themselves realize the value of exercise. More of them upon rising should spend three to five minutes in gymnastic exercises than is apt to be the case.

So important is exercise for the proper assimilation of carbohydrate that even surgical patients are urged to exercise. Occasionally this is accomplished by pulley weights attached to the foot of the bed and by dumb bells, but for others Miss Munro gives passive exercises or teaches bed gymnastics. This undoubtedly explains in part why diabetic patients today withstand surgical operations better than formerly.

Exercises for the promotion of the circulation in the legs are of great service. They may ward off gangrene. Such exercises are described upon p. 131.

Exercise burns up carbohydrate just as does insulin. Case No. 1889 walked 10 miles one morning and developed an insulin reaction; the next day without exercise but with diet and dose unchanged no reaction appeared.

If the patient by means of exercise can have 5 grams more of carbohydrate a day, the added comfort is considerable for it allows various alternatives, such as 100 grams of grapefruit, 70 grams of strawberries, 50 grams of orange, a small tablespoonful of cooked oatmeal, or a Uneeda biscuit. Case No. 632 says a game of golf does more, it saves 5 units of insulin.

Case No. 1024, a lady, aged seventy-eight years, not only took exercise in the forenoon and afternoon, but went out for her walk in the evening with a flash light.

Case No. 804, a patient whose diabetes changed from severe to moderate and finally from moderate to mild under his own care at home, wrote that he considered exercise of the greatest importance. He said that he had the best garden of anyone in his city.

Case No. 7500, a young farmer had an insulin reaction when he went out in the woods to chop. His exercise reduced his need for insulin.

Case No. 352 outlived his expectation of life, having had diabetes twenty-three years, and throughout this time he led a most active existence. He wrote:

"First, it is very hard to start the exercise, and the less one feels inclined to start it the more one needs it. Second, it is neither necessary nor desirable that the exercise should be violent. I found a quiet ride of an hour, walking or jogging, after taking something on the stomach started up my old metabolism for the whole day. If I rode hard, I got tired out."

Finally, it is astonishing how much exercise a diabetic in training can take. One of my severe cases, living on a strict diet, several years ago walked between 20 and 30 miles in one day.

To many persons exercise seems a luxury, but a diabetic is fortunate in that he must always consider exercise a necessity.

Athletic contests are allowable for diabetics today, but on account of the danger of a reaction, as a result of the strenuous exercise, every diabetic under such circumstances should have a confederate who will keep a friendly eye upon him. Insulin reactions are very commonly brought on by exercise, but that is no contraindication. Either the diet can be increased or the insulin reduced.

Rest. Rest is essential. A tired child is put to bed and wakens refreshed; two of the most noted surgeons in the country are not ashamed to leave their guests at the table and lie down for fifteen minutes after their luncheon; the best treatment for a failing heart is to put its owner in bed for a week. Diabetic patients should rest often, should never allow themselves to get overtired. The diet is designed to give a rest to the pancreas. Sleep nine hours and more if you can. Short periods of complete relaxation yield maximal returns.

Mental Attitude.— Forget that you have diabetes and do not talk about it with others. This is one reason for not using saccharin, and another is to avoid the perpetuation of a sweet taste, thus reviving the thought of the previously unrestricted diet.

Mental diversion is desirable, but anxiety is harmful.

FIG. 21.—Case No. 5952. Age at onset, fifty-two years four months. Duration to December, 1928, six years. This patient had a cold start from Alaska, but the first 400 miles of his journey were made cheerful by these dogs, and he received a warm welcome when he arrived. Recent diet: Carbohydrate, 180 grams; protein, 82 grams; fat, 137 grams. Insulin, 7–0–7.

Heavy responsibilities should be avoided as well as nervous upsets and emotional excitements. It is almost as dangerous for a diabetic to get angry as it is for a man with angina pectoris, and in some individuals both diseases are combined. Case No. 1157 had been sugar-free for five days, but sugar came back when he had an important conference with one of his superintendents.

Thoreau would have made a wonderful diabetic and diabetics would do well to adopt his philosophy of life and at least read his "Walden."

Wear warm clothes instead of staying by the radiator or in an overheated room. Wear light-weight clothes, using several thicknesses if necessary. Heavy overcoats exhaust a diabetic. Men should appreciate the value of light-weight clothes just as much as do women.

The art of learning how to get the most out of life under all circumstances must be cultivated by any patient. It takes time, thought, and practice to accommodate one's methods of living to changed conditions, but it pays to study the problem.

FIG. 22. Case No. 4073. Age at onset six years. Duration to December 1928, five years, two months. Betty turned a handspring at the Clinic before the American Medical Association in Washington in June, 1927. This is her latest feat. Recent diet, carbohydrate 90; protein 64; fat; 107. Insulin 16 0 10.

CHAPTER VIII.

THE DIET OF NORMAL INDIVIDUALS.

Food and Fuel.—Foods are fuel for the body, just as gasoline is fuel (food) for an automobile. Man and automobile depend upon fuel as a source of energy. In case the gasoline gives out the automobile will stop, but if the food gives out the man will not immediately die, because he carries a good deal of his fuel stored up in his body, first and chiefly as fat, second, a lesser amount in the form of protein in the muscles and various tissues, and third, a little in the form of carbohydrate as animal starch (glycogen) and sugar in the liver, muscles, and blood.

A fasting man at the Carnegie Laboratory in Boston went without food for thirty-one days, living upon his reserve supply of food, in other words his own tissues.

Just as one can measure how much gasoline is required for an automobile to run 100 miles, so one can measure how much food is necessary for a man to live for twenty-four hours and do a given amount of work. Small automobiles required less gasoline than large automobiles, and this is pretty much true of individuals, for the food which they need depends upon their weight. There are exceptions. Children require proportionately more food, because they are growing, and old people require less, because they are quieter. If an adult behaves like a child in that he eats like a child, he will grow fat. How unfortunate there is no one to spank him and thus save him possibly from acquiring diabetes later! However, indigestion occasionally comes to the rescue and saves his life. Just as the automobile depends upon gasoline, oil, and water, the human automobile depends upon carbohydrate, protein, and fat, water, and various salts. If the food value of 1 gram of the foods, carbohydrate, protein,

and fat is known, and also the quantity of each food which is eaten, the total food value of the diet can be determined.

The nutritive value of the diet is readily computed by referring to Table 3, page 48, and by bearing in mind the caloric values of the various foods. (See page 37, Question 18). Table 4, page 50, will serve as an example.

Another method allows the food required by a given individual to be calculated far more accurately. By this method the total heat given off by a man at rest or at work is measured.

This total heat represents energy which has been derived from the oxidation (burning up or utilization) of the three foodstuffs—carbohydrate, protein, and fat. It is unessential whether the foodstuffs oxidized have been taken within a few moments as food or whether they represent food deposited in the body as fat (fat tissue), protein (muscle tissue) or carbohydrate (glycogen *i. e.*, animal starch). Knowing the total heat given off it is not a difficult matter to calculate how much carbohydrate, protein and fat were required to produce it.

Experiments have demonstrated that the heat which is liberated in the body from the combustion of 1 gram of protein or of carbohydrate produces 4 Calories, from 1 gram of fat, 9 Calories and from 1 gram of alcohol, 7 Calories. Fat, as would be expected, is more than twice as nourishing as carbohydrate or protein. With these figures in mind it is easy to estimate with sufficient exactness from dietetic tables the calories in the diet required to replace the heat given off by the body during the period of experiment. The result of such calculations is embodied in what follows:

The caloric needs of the body vary not only from day to day and hour to hour, but from moment to moment. The calories required by the average normal adult when at rest are about 25 per kilogram body weight. If the individual is sitting in a chair instead of lying on a couch 20 per cent more energy is required, though if the individual is in a semi-reclining position the need for calories is even less than when lying down. Too often in dietetic computations it is assumed that the caloric needs of the body can be accurately estimated. As a matter of fact, the error in such computations is con-

siderable, and it is absurd to expect to compute the needs of the individual when up and about, whether normal or diabetic, more closely than within 10 to 20 per cent of the real value. The reason for this is apparent if one observes the attitudes and motions of individuals in a street car. The one is quiet, the other restless, the one avoids exertion, the other is all activity. In disease these differences of habit and disposition are accentuated. One patient with 40 Calories per kilogram body weight will gain pounds, the other will barely hold her own weight. A diabetic patient, Case No. 1541, an old lady, aged fifty-eight years, confined for a year to her bed with paralysis remained sugar-free, held her weight constant and the diet, accurately weighed by a trained nurse for the entire period, averaged 20 Calories per kilogram body weight per twenty-four hours.

As an illustration of the amount of work which can be performed by 1 Calorie of energy, I learn from my friend, Professor Benedict, that the expenditure of 1 Calorie of heat is required to rise from a sitting position in front of a door, turn the key in the door, and sit down. A single 16-candle-power carbon lamp gives off in heat the equivalent of about 45 Calories per hour, which represents a little less than the heat, basal metabolism, of an adult weighing 50 kilograms.

It is desirable for us all to visualize calories and to that end various concrete examples of what calories derived from food will enable an individual to do are given. To walk one hour on a level road at the rate of 2.7 miles an hour requires 160 Calories above that of keeping quiet (Lusk). I suspect one will not err greatly if for each mile of walking one allows 1 Calorie per 1 kilogram body weight.

A man of 60 kilograms walking up 10 flights of stairs, each flight 3 meters (10 feet) high, in three minutes would expend the heat equivalent of 26 Calories or about 3 Calories per flight. This would be equivalent to nearly nine times his basal metabolism for the same period.

The metabolism of a group of men standing was 12 per cent more than when in the horizontal position, according to H. M. Smith. He also found that walking at 2 miles an hour nearly doubled the standing requirement and at 4

miles an hour increased it three-fold. Farmers in various parts of the United States have been shown to consume on an average 3500 Calories.

Sewing and knitting require about 9 Calories per hour more than that for the same subject sitting quietly in a chair, while washing, sweeping and scrubbing floors require 50 Calories additional. Ironing and dish-washing each require about 25 Calories additional. (Langworthy and Barott.)

TABLE 7.—CALORIES REQUIRED DURING TWENTY-FOUR HOURS BY AN ADULT WEIGHING 70 KILOGRAMS (154 POUNDS).

Condition.	Calories per kilogram body weight.	Calories per pound body weight.	Total calories.
At rest	25–30	11–14	1750–2100
Light work	35–40	16–18	2450–2800
Moderate work	40–45	18–20	2800–3150
Hard work	45–60	20–27	3150–4200

Children require far more food than adults, because of growth and increased activity. This is shown in Table 8.

TABLE 8. CALORIC NEEDS OF CHILDREN DURING TWENTY-FOUR HOURS.

Age, years.	Weight.		Calories per kg. body weight.	Calories per pound body weight.	Total calories.
	Kilograms.	Pounds.			
2	12	26	80	36	960
6	20	44	70	31	1400
12	36	80	50	23	1800

One is apt to conclude that an individual doing heavy work requires additional calories for the entire twenty-four hours. This is by no means true. With the cessation of work the metabolism falls abruptly. Furthermore, the actual period of heavy work is short and represented by minutes rather than hours. If of a pessimistic nature one has only to watch street laborers to be convinced, though a far more enjoyable and as scientific a proof is furnished by the minutes spent in actual play by the teams of football. In an entire game the minutes in which the ball was in play numbered eleven, according to the stop-watch observations of the late Prof. Harold C. Ernst, and Mr. Robert Fisher tells me that in

the Boston College—Holy Cross game of 1922 the ball was in play eleven minutes and twenty-three seconds. Carpenter found 30 Calories per hour additional were required by a typist writing at the rate of 50 words a minute compared with sitting still and reading. As age advances the metabolic requirements are lessened, thus if 1677 Calories are required for basal metabolic needs at thirty years, 1542 are required at fifty and 1407 at seventy years of age.

Composition of the Normal Diet.—The ordinary diet for a man at moderate physical work would contain about 400 grams of carbohydrate, 100 grams of protein and 100 grams of fat. This would amount to 2900 Calories in the twenty-four hours, or about 40 Calories per kilogram for an individual weighing 70 kilograms (154 pounds). These figures would be proportionately reduced both for those of lower body weight and for those with lighter occupations who would require nearer 30 Calories per kilogram.

TABLE 9.—THE CARBOHYDRATE, PROTEIN AND FAT IN THE DIET OF A MAN DOING MODERATE WORK; WEIGHT, 70 KILOGRAMS (154 POUNDS).

Food.	Quantity, gm.	Calories, per gm.	Total calories.
Carbohydrate	400	4	1600
Protein	100	4	400
Fat	100	9	900
			2900

Chittenden, in his painstaking and scientific manner, accomplished an immense amount of good when he showed that people ordinarily consumed much more food than physiological needs demand. He suggests that it is more than probable that this excess of food is detrimental to health, weakening rather than strengthening the body and defeating the very object of nutrition.

From Table 9 it will be seen that more than one-half (55 per cent) of the energy of the diet of the normal individual consists of carbohydrate. These figures are only approximate, but they leave no doubt as to how large a place sugar and starch occupy in the daily ration. In fact it is estimated

that the average individual in the United States consumed 103 pounds of sugar during the year 1923 or a little over one-quarter of a pound (127 grams) daily.

The quantity of protein in the normal diet of an adult is decidedly less than 100 grams. From investigations of the diets of medical students it would appear that they eat between 76 and 90 grams each day.

There is little doubt but that it is safe for an individual to live upon 1 gram protein per day for each kilogram body weight, and a doctor's worry ends if his patients secure 60 grams protein, even though the students ate rather more. Protein is animal food to a large degree; hence its cost. This is an added reason for being sparing in the use of protein. There is also still another reason, because if an excess of protein is burned the other foods are also consumed more rapidly, and there is more chance for the heat so produced to go to waste.

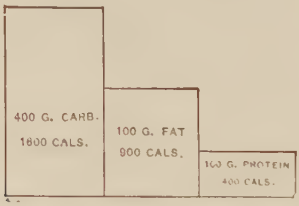


FIG. 23.—The relative caloric value of protein, carbohydrate and fat in a normal diet.

The quantity of fat in the normal diet varies partly from choice and partly from economic reasons. In general in those cases in which the carbohydrate in the diet is high the fat is low, and *vice versa*. The Voit standard placed the fat at 55 grams, but in a series of 1300 dietary studies of families, carried out among different races and in different countries, it was shown that the average quantity of fat eaten was about 135 grams (4.5 ounces) per person per day, the variation recorded being from 45 to 390 grams per person per day.

The more agreeable varieties of fat, such as butter, cream and oil, are expensive foods. Fat is also a concentrated food, not only because it has twice the caloric value of either carbo-

hydrate or protein, but because it occurs more frequently in pure form. Oil, butter and lard contain little water, whereas except for pure sugar and starch most carbohydrates and proteins are diluted five to ten times with water.

The chief source of error in calculating the total caloric value of the diet, and especially of the diabetic diet, is in the estimation of fat. Anyone can realize this upon examining a piece of meat with its fringe of fat. The fat in bacon is most variable, and in amount its value can only be approximately estimated. Portions of bacon lose from 43 to 67 per cent of fat in the cooking. For this reason some physicians prefer to have the allowance of bacon for their patients weighed uncooked and then the fat which escapes in the process of cooking can be utilized in the preparation of their other food As the proportion of protein to fat in different samples of bacon varies considerably the inconvenience of weighing the bacon uncooked has hardly seemed to me to counterbalance the questionable gain in accuracy. For this reason my patients weigh their bacon after it is cooked.

Eggs in some cities by law must weigh $1\frac{1}{2}$ pounds a dozen, an average of 60 grams (2 ounces) apiece. Such eggs contain approximately 6 grams of protein and 6 grams of fat. How gross our caloric reckonings are is obvious if a collection of eggs is weighed and the minimum and maximum weights noted. The weight of the heaviest egg in a collection of 56 eggs was 72 per cent more than that of the lightest. The 6 grams of protein are equally divided between the white and the yolk, but the 6 grams of fat are all in the yolk. When protein without fat is desired in the diet 1 whole egg and the whites of 2 others can be made into a dish of scrambled eggs. This would contain protein 12 grams and fat 6 grams.

The weight of 1 egg shell is usually about 7 grams.

Milk may be employed in the treatment of diabetes, but it must be prescribed and taken with care, because of the large quantity of carbohydrate, protein and fat which it represents. A glass of milk is drunk so easily that one is apt to forget that it contains 12 grams carbohydrate, 8 grams protein and 8 grams fat. Fig. 24, page 72, makes this clear.

Skimmed milk and buttermilk contain the same quantity of carbohydrate and protein as whole milk, but differ from it in the absence of fat. Thirty cubic centimeters (1 ounce) of skimmed milk, whole milk or buttermilk contain 1.5 grams of carbohydrate and 1 gram of protein, and 1 quart of skimmed milk contains approximately 48 grams carbohydrate and 32 grams protein. Whey contains 5 per cent carbohydrate, but practically no protein or fat. Cream and koumiss contain about 3 per cent carbohydrate, or 1 gram to the ounce. The Jewish sour cream contains about one-half as much.

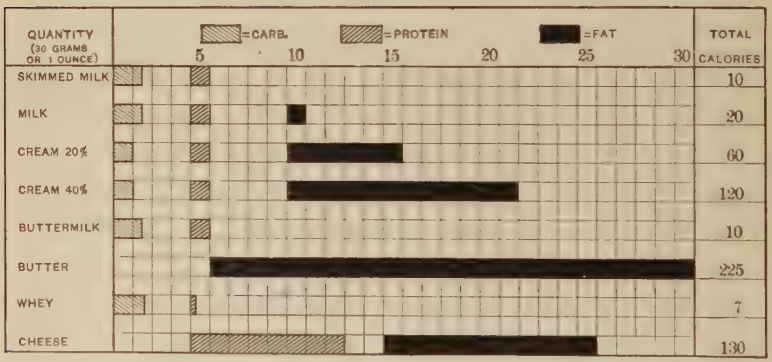


FIG. 24.—Milk and milk products. Carbohydrate, protein and fat in 30 grams, or 1 ounce. Each lineal division represents 1 gram.

Diabetic patients seldom become sugar-free on a milk diet. They may become sugar-free if so little milk is taken that they are partially fasting.

The high nutritive value of cream, butter and cheese is evident from Fig. 24. This makes these special milk products desirable, but, if carelessly taken, danger of acid poisoning arises from the large amount of fat which they contain. The high protein value of milk—1 gram to the ounce, 32 grams to the quart—is important to consider, not alone because of the protein itself, but also because from protein sugar is often formed. Cheese contains about one-half again as much protein as fish.

Repeatedly physicians and patients have requested me to arrange the common articles of the diabetic diet men-

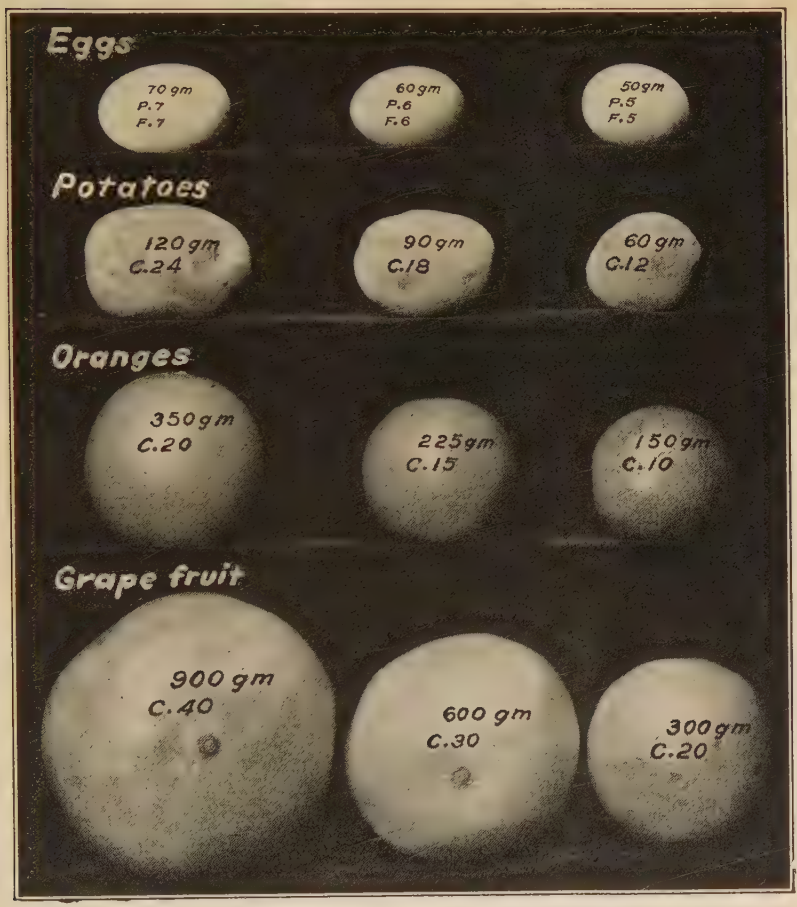


FIG. 25.—Variations in the sizes of common foods. The weights are gross weights. *C.* = carbohydrate; *P.* = protein; *F.* = fat.

tioned in Table 3 in terms of household measure. To a considerable extent this is impracticable, because the diabetic

diet deals with so small a quantity of carbohydrate. For this reason the only safe way for diabetic patients at the commencement of their training is to weigh their food. After a few days of weighing, patients can select utensils from their own pantry or china-closet which conform to the size of the portions of their own special diets and use these exclusively. By this means needless weighing is avoided.

Patients and physicians often err in thinking their computations of the diet are extremely accurate. In order to demonstrate the errors which easily arise from general statements about foods, Fig. 25, page 73 is inserted.

It is manifestly inaccurate to allow one orange in lieu of 10 grams of carbohydrate, for, as the illustration shows, three oranges may contain respectively 10, 15 or 20 grams carbohydrate each.

A similarly wide variation in carbohydrate content occurs in grapefruit of various sizes. For convenience the percentage of carbohydrate in grapefruit is reckoned as 5 per cent, but it probably is often 7 per cent. The oranges from left to right are sold under the trade names of 126, 170 and 250 (to the box) and the grapefruit under the trade names of 28, 64 and 96 (to the box). At the New England Deaconess Hospital, oranges and grapefruit are now prescribed according to the weight of the peeled pulp. Errors in eggs may compensate themselves, because the eggs average about 60 grams. Potatoes vary enormously in size, the diagram of the smallest shown here is in reality the size of an egg. It is quite unsafe to guess at the size of a potato. A banana on the other hand contains the same percentage of carbohydrate as a potato, but its size is so constant that on the average a banana can be reckoned as 20 grams carbohydrate. It is not so easy to describe the size of a potato which would contain 20 grams of starch.

It is partly on account of the ease with which large errors in the carbohydrate content of food may occur that it is desirable to give to patients with a low carbohydrate tolerance their carbohydrate in the form of 5 per cent vegetables exclusively, for an error in weight, reaching 120 grams (4 ounces) could not exceed 6 grams of carbohydrate.

CHAPTER IX.

THE DIET OF DIABETIC INDIVIDUALS.

The diet in health is made up chiefly of carbohydrate; the diet in diabetes is made up chiefly of fat. Both in health and diabetes it is desirable to keep the values for protein about the same. The task of the diabetic, therefore, is to learn how to live comfortably upon far less carbohydrate than that to which he has been accustomed and upon far more fat. The diet of the Eskimo formerly was not greatly unlike that of the diabetic today. It takes time and experience to live successfully upon a diabetic diet, because the body must adjust itself to the changed conditions. That it does so at all is indeed wonderful.

A comparison of the components of the normal and diabetic diets is given in Tables 10 and 11, and in Figs. 26, 27 and 28.

Table 10.—Normal and Diabetic Diets Compared. Adult Weighing 132 Pounds (60 Kilograms).

Food.	Comparison in grams.		Comparison in calories.	
	Normal.	Diabetic.	Normal.	Diabetic.
Carbohydrate . . .	250	100	1000	400
Protein	60	60	240	240
Fat	60	120	540	1080
Total	...	...	1780	1720

The normal individual weighing 60 kilograms, 132 pounds, takes 250 grams carbohydrate, but the average diabetic not over 100 grams. Each takes 60 grams of protein. To make up the loss of carbohydrate, the diabetic increases the fat of the normal diet which is only 60 grams to twice the quantity, namely 120 grams. Remembering that 1 gram of carbohydrate or protein produces 4 Calories when it is burned in the body and that 1 gram of fat produces 9 Calories, one can arrive at the figures in the right half of Table 10. Carbohydrate yields 1000 Calories to the normal, but only 400 to the diabetic, the calories from protein are the same, but the

540 Calories which the normal individual receives from fat are changed to 1080 in the diabetic. It will be noted that the total caloric value of the diabetic diet is slightly less than that of the normal diet. This is so arranged with design, partly because the diabetic patient needs less calories since he is less active and partly because an improvement of the diabetes is favored by the avoidance of any surplus food.

TABLE 11.—COMPARISON OF NORMAL AND DIABETIC DIETS IN ACTUAL FOODS COMPUTATIONS BASED UPON TABLE.

Food.	Total food in grams.		Normal.				Diabetic.			
	Normal.	Diabetic.	C., gm.	P., gm.	F., gm.	Cal.	C., gm.	P., gm.	F., gm.	Cal.
5% vegetables	300	600	10	5	0	..	20	10	0	
Orange . .	200	300	20	0	0	..	30	0	0	
Oatmeal[1] . .	30	30	20	5	2	..	20	5	2	
Egg . . .	1	1	..	6	6	..	..	6	6	
Cream . . .	...	240	..	..	..	..	8	8	48	
Bacon . . .	15	30	0	3	8	..	0	5	15	
Butter . . .	30	40	0	0	25	..	0	0	33	
Meat . . .	60	90	0	16	10	..	0	24	15	
Bread . . .	180	30	108	18	0	..	18	3	0	
Potato . .	120	...	24	4	0					
Milk . . .	240	...	12	8	8					
Banana . .	100	...	20	0	0					
Sugar . . .	30	...	30	0	0					
			244	65	59	1767	96	61	119	1699

[1] Weight dry 30 grams, if cooked 240 grams.

Caloric Needs of the Diabetic.—The diet of the diabetic patient should contain, except for brief intervals, the minimum number of calories which the normal individual would require under similar conditions. Many normal individuals, in my opinion, actually live upon less than 30 Calories per kilogram body weight, and repeatedly one sees diabetic patients over fifty years of age who comfortably live upon less for long periods. This is true only for the treated diabetic. If the patient is allowed more than the minimum amount of food there is far more likelihood that a portion will be unassimilated and appear as sugar in the urine. One of the first rules for the diabetic patient to learn is never to

FIG. 26.—The normal diet. See Table 11 for size of portions.

	Milk		
Bread	Oranges	Bacon	Lettuce
Oatmeal	Potato	Meat	Asparagus
Sugar	Banana	Butter	Egg

FIG. 27.—The diabetic diet. See Table 11 for size of portions.

Standard Diet of 1923.

String beans	Cream	Bacon	Lettuce
Tomatoes	Oranges	Meat	Asparagus
	Oatmeal	Butter	Egg

Standard Diet of 1929. Add an orange or equivalent fruit and 4 Uneeda Biscuits or 1 ounce (30 grams or 1 slice) bread.

overeat. He should be a model in food conservation for his household. In pre-insulin days he always returned a clean plate because his appetite was equal to the food allowed. Insulin should make him no less cautious.

TABLE 12.—THE EFFECT OF THE RESTRICTION OF FOOD UPON DIABETIC MORTALITY.

	Berlin.	Munich.	Breslau.
1913	409	105	100
1914	467	104	115
1915	383	101	113
1916	331	82	78
1917	264	73	72
1918	177	77	51

The beneficial effects of a low diet upon diabetic patients were repeatedly observed in Germany during the years 1924 to 1928. This is well shown in a paper by Rosenfeld, of Breslau, from which Table 12 is constructed. Even in the United States the census reports for 1916 and 1917 show for almost the first time in a generation and a half a decline in the mounting death-rate from diabetes.

Carbohydrate in the Diabetic Diet.—The total carbohydrate in the diet of diabetic patients is usually restricted to about 100 grams, and but seldom is less than one-fourth of the normal carbohydrate ration. It was formerly much less. It so radically changes the composition of the normal diet as to make it self-evident that rapid changes from a normal to a diabetic diet containing even 100 grams carbohydrate might easily cause indigestion in normal as well as in diabetic individuals. The lowering in carbohydrate must be compensated eventually by an increase in fat.

The Estimation of the Carbohydrate in the Diabetic Diet.—The quantity of carbohydrate in various foods is easily calculated and far more simply than is usually thought. (See Table 3, page 48, with accompanying text.) Fortunately the content of carbohydrate in the 5 and 10 per cent groups of vegetables is so small that one is justified in the vast majority of cases in accepting an average figure for each group. It is true that there is considerable variation in the vegetables as classified in Table 2, but the average content in carbohydrate for all vegetables under one heading is not far from that represented, the error being in the assignment of

too high rather than too low values. This does not hold for string beans, because trouble often occurs from the string beans containing the mature beans thus greatly increasing their content in carbohydrate. Many an unexplained trace of sugar in the urine has undoubtedly occurred in this way. "Refugee" beans are an excellent variety. "Kentucky Wonder" beans are also highly recommended for the garden, because they last so long. In the same way squash, summer squash, vegetable marrow, and so on vary in composition according to maturity. Young vegetable marrow and young summer squash are safely included in the 3 per cent column, while mature fruit of any squash may be expected to run between 5 and 10 per cent.

One will not be very wrong if he considers the maximum amount of carbohydrate which a diabetic will secure from 5 per cent vegetables in the twenty-four hours as 20 grams. This is why in mild cases of diabetes it is unnecessary to weigh the vegetables, for it is improbable that a patient will eat too much of these. He is far more likely to eat an insufficient quantity. One must never forget that a diabetic likes to eat and that he can seldom eat anything less harmful than 5 per cent vegetables. Tactful wives always provide their diabetic husbands not only with an abundance, but a wide variety, of these vegetables and take infinite pains to get the best and to prepare them with the utmost care. Even a moderately severe diabetic can partake very freely of these, and particularly is it the case when those selected are lettuce, cucumbers, spinach, asparagus, rhubarb, endive and vegetable marrow.

Thrice-cooked Vegetables.—Vegetables lose carbohydrate in the cooking, and this loss is favored (1) by changing the water in which they are prepared two or three times, and (2) by preparing the vegetables in finely divided form so that the water can have easy access to the whole mass. Such vegetables were used extensively in the days of undernutrition prior to the discovery of insulin. Von Noorden pointed out that 100 grams of raw spinach contained 2.97 grams carbohydrate, but cooked spinach only 0.85 grams. Similarly, 100 grams of ripe peaches contained 9.5 grams carbohydrate, but when boiled and the water changed, only 1.8 grams.

Allen advantageously used this method of removing carbohydrate from vegetables and thus allowed patients to have bulk in their diet. He termed vegetables so prepared "thrice-cooked vegetables." "Under these conditions the vegetables may be boiled through three waters, throwing away all the water. Nearly all starch is thus removed. The most severe cases generally take these thrice-cooked vegetables gladly and without glycosuria."

The Carbohydrate in Various Foods.—1. *Lettuce and Cabbage.*—Lettuce and cabbage are the most useful 5 per cent vegetables. Bulletin No. 28, Office of Experiment Stations, U. S. Department of Agriculture, gives 2.9 as the average percentage of carbohydrate in the former and 5.6 for the latter. By its bulk lettuce satisfies the appetite and the quantity allowed is unlimited. Cabbage is the poor man's 5 per cent vegetable. It can be eaten daily for months, raw and cooked, without repugnance. Its composition is so constant that the amount tolerated can readily be determined. Case No. 866 was sugar-free at the hospital with difficulty and in the course of eight months the lowest blood sugar was 0.13 per cent. When he went to sea on a lumber schooner and lived almost exclusively on cabbage for his vegetable, he returned after one month not only without glycosuria but with a blood sugar of 0.1 per cent. In the spring of 1922, he went to sea again, returning to the hospital in October with no glycosuria and with a blood sugar of 0.12 per cent.

2. *Potatoes.*—The variation in the percentage of carbohydrate in potatoes before and after cooking is negligible, save with potato chips, in which on account of the loss of water in their preparation the carbohydrate is more than doubled. Similarly the carbohydrate in artichoke chips or flakes is about double (30 to 35 per cent) that in the Jerusalem artichokes themselves which is 15 per cent. Emphasis should be laid upon the comparatively small amount of carbohydrate in potato in proportion to its bulk in comparison with the large percentage of carbohydrate in bread. A considerable number of my milder cases of diabetes, by giving up bread and bread preparations entirely, have been able to eat potatoes freely. In prescribing potatoes for diabetic patients

it is desirable to designate baked potatoes. These can be eaten agreeably together with the skins when they have been carefully cleaned with a scrubbing brush in the kitchen. Baked potatoes are advantageous in two ways: the skins are quite an addition to the meagre diet of the diabetic, and they counteract constipation.

3. *Nuts.*—Nuts containing 15 and 20 per cent carbohydrate are probably far less objectionable than most other foods with a similar carbohydrate content. This is due to the fact that in such nuts as almonds and peanuts a larger part of the carbohydrate is in the form of pentosan, galactan or other hemicelluloses, which probably do not readily form sugar. There is a field for investigation open here. On the other hand, nuts are dangerous for a diabetic unless allowance is made for the considerable quantity of protein and the very large quantity of fat which they contain. One ounce of castanas (Brazil nuts) represents about 6 nuts in which there are carbohydrate 2 grams, protein 5 grams, and fat 20 grams, or 210 Calories! Ignorant diabetics often eat nuts as freely as they would 5 per cent vegetables and wonder why they develop sugar in the urine and acid poisoning. Case No. 1930, quite mild when her treatment was inaugurated, went home, ate nuts about as freely as some 5 per cent vegetables, and escaped diabetic coma, but only through severe undernutrition from which a special nurse and insulin have rescued her.

4. *Fruit.*—Fruit is most desirable for a diabetic patient if his tolerance will allow him to take it. The taste is agreeable, it serves instead of a dessert, and so relieves the patient of the embarrassment of sitting idly at the table when others are eating. The best varieties of fruit for diabetic patients are grapefruit, which I generally reckon as containing 5 per cent of carbohydrate, strawberries (6 per cent), and oranges (11 per cent). As a rule patients can take twice as much grapefruit as orange with impunity. These fruits are safer for the patient than apples (13 per cent), because they contain 5 to 10 per cent less carbohydrate and are more satisfying. Furthermore, it is less easy thoughtlessly to eat an orange than an apple and thus break dietetic restrictions. To a diabetic an apple is devoid of skin, seeds and core. A

small apple contains 1 tablespoonful of sugar and a large apple 3 tablespoonfuls. I never have any success in allowing apples to diabetics. Hence all the children reply in answer to the question "What should a diabetic do with an apple?" "Give it away."

An apple has always been a source of temptation. "Of Man's first disobedience, and the fruit of that forbidden tree . . . ."

Vienna children are less fortunate than American children in that grapefruit are less plentiful. In the Pirquet clinic apples of necessity are the chief fruit of the diabetic children.

At present my patients use the following equivalents in their choice of fruits and certain other foods as representing 10 grams carbohydrate (Table 13). The values are approximate.

TABLE 13.—EQUIVALENTS OF 10 GRAMS CARBOHYDRATE IN VARIOUS FRUITS AND FOODS.

	Gm.		Gm.		Gm.		Gm.
Orange pulp	100	Pineapple	100	Blueberries	65	Artichokes, raw	65
Grapefruit pulp	200	Watermelon	120	Strawberries	150	Artichoke flakes	30
Banana	50	Peaches	75	Blackberries	75	Ice cream	50
Raspberries	75						

5. The quantity of carbohydrate in a very small orange is about 10 grams. The same statement will apply to one-half a small-sized grapefruit, one-half a medium-sized apple or banana. One will not be far wrong to consider that one compartment of a very small orange contains 1 gram carbohydrate. The illustration on page 73 shows that larger oranges and larger grapefruit easily contain twice as much carbohydrate as do the smaller varieties.

6. *Bananas.*—That today a considerable number of diabetics can have one-half of a banana or even a whole banana is mute witness to the advance in treatment during the last few years as a result of diet and insulin. Bananas have this advantage over grapefruit, oranges, and especially apples and potatoes, because they are more uniform in size. The average banana weighs 100 grams and hence contains 20 grams carbohydrate. This is the same amount as is contained in 1 ounce, 30 grams, of dry oatmeal the equivalent of a saucerful of cooked oatmeal or 4 Uneeda biscuits.

In general the riper a banana, and for that matter any vegetable or fruit, the more of the starch in it has changed to sugar; and also the more carbohydrate it contains. Since unripened fruits with their lower carbohydrate content can be made palatable by cooking, a way is afforded for diabetic patients to use them.

7. *Ripe Olives.*—Ripe olives make a pleasing change in the diet. They contain 4 per cent carbohydrate in contrast to green olives, which contain 1.6 per cent. Furthermore, ripe olives are more easily digested. Five ripe or 10 green olives contain 1 gram carbohydrate and 5 grams fat. The quantity of protein in 10 olives is about 1 gram.

8. *Distilled Vinegar.*—Distilled vinegar contains no protein, fat, or sugar, because it is made from a dilute alcoholic distillate. Cider, wine, malt and sugar vinegars are made of fermented juices, infusions, or solutions, *not distilled*, and may contain small amounts of sugar, etc. For analyses of vinegar, see page 218.

9. *Milk.*—The carbohydrate in milk is in the form of lactose and can be reckoned at 5 per cent, or 1.5 grams per 30 cc., or 1 ounce. It is the same in skimmed milk, buttermilk, and whey; but cream and koumiss contain about 3 per cent, or 1 gram carbohydrate to the ounce. Buttermilk contains essentially the same quantity of carbohydrate and protein as milk, but only a trifling amount of fat. Fermented milk may contain 3 per cent sugar.

One quart of milk contains about 660 Calories, of skimmed milk 370 Calories, of cream with 20 per cent butter fat 2000 Calories, and of 40 per cent cream 3700 Calories. Milk contains so many desirable food elements that it is always beneficial to insert some of it usually in the form of cream into the diet. (See pages 71, 72.)

10. *Oatmeal.* Oatmeal is two-thirds carbohydrate. In calculations one should be guided always by the dry weight, because the different forms of oatmeal vary greatly in bulk and weight when cooked. It is a simple matter for a few days to weigh out 30 grams (1 ounce) of dry oatmeal, containing 20 grams carbohydrate, have it cooked and note the weight and bulk. By dividing the oatmeal thus cooked into four portions each would contain 5 grams carbohydrate.

FIG. 28.—An apple is dangerous for a diabetic. The sugar in a large apple amounts to as much as the starch in a large roll or the sugar and starch in two bananas or in seven portions of cabbage, celery, asparagus, lettuce, tomato, spinach and string beans. It is not that the sugar in an apple is particularly harmful, but rather that there is so much of it. An apple is eaten in a twinkling, but to eat an orange requires deliberation, and hence less likely to be taken thoughtlessly.

In weighing foods with the usual variety of scales one should never attempt to weigh out quantities as small as 5 grams. A more reliable result is obtained by weighing out multiples of 5 grams and then dividing into enough portions to make each portion 5 grams.

A shredded wheat biscuit, weight 30 grams, can be used almost interchangeably with 30 grams of oatmeal because it contains but 23 grams of carbohydrate. Its uniform size and its availability at all times make it an extremely convenient article of food for a diabetic patient.

11. *Bread.*—Bread is an aggravation to a diabetic, because he can tolerate so little without showing sugar unless his tolerance is notably high. An error of 1 ounce in the weight of 5 per cent vegetables amounts to 1 gram carbohydrate, but of bread to 18 grams. The carbohydrate in white wheat bread amounts to about 53 per cent. If the bread is toasted, enough water is lost to raise the percentage of carbohydrate in the toast to about 60 per cent. If the bread is made without sugar and with water instead of milk, the carbohydrate content is lowered and may amount only to 45 per cent. Coarse breads if made without sweetening or milk would contain slightly less carbohydrate. If the tolerance for carbohydrate is less than 100 grams, breads are best avoided.

Crackers and zwieback contain still less water than toast, and in consequence the percentage of carbohydrate is raised to the neighborhood of 70 per cent. Many gluten breads upon the market contain as much as 30 per cent carbohydrate and the protein may reach 40 per cent. Thus in 30 grams or 1 slice there would be as much protein as in 2 eggs. As nearly 60 per cent of protein can change to sugar the danger of the use of gluten breads is obvious. The black Jewish bread contains about 40 per cent carbohydrate (page 211).

Bread can be prescribed with considerable accuracy by volume instead of by weight. A piece of bread 3 by $2\frac{1}{2}$ by $\frac{3}{4}$ inches (7.6 by 6.3 by 1.9 cm.) contains about 15 grams carbohydrate. For convenience I sometimes give my patients a block of wood of these dimensions. As white bread is light and dry and contains a high per cent of carbohydrate and the coarse breads are heavy and moist and contain a low per cent

of carbohydrate, one can almost more safely prescribe a bread block of bread than a weighed quantity of bread. It will be noted that the bread block is thick so as to minimize error which would be considerable if the bread block were cut as the conventional slice of bread.

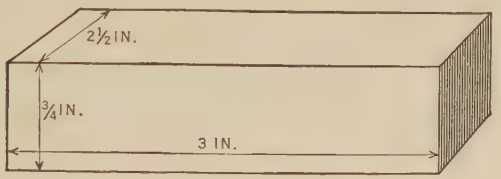


FIG. 29.—Any kind of bread, light or heavy, cut this size contains about 15 grams carbohydrate. Dimensions, 3 by 2½ by ¾ inch.

Protein in the Diabetic Diet.—The quantity of protein required by diabetic patients varies with the age, weight and activity of the case as well as with the condition of the kidneys. It is a safe rule at the beginning of treatment to attempt to increase the protein gradually up to the same quantity as that required by a normal individual. This is approximately 1 to 1.5 grams per kilogram body weight for adults, but for children it may reach 3 grams.

Chittenden points out that 60 grams (one-half the old standard protein) are quite sufficient to meet all the real physiological needs of the body under ordinary conditions of life, and that with most individuals not leading an active outdoor life even smaller amounts will suffice. Chittenden, weighing 57 kilograms, and Mendel weighing 70 kilograms, lived respectively on 34 and 41 grams protein daily, the former for nine and the latter for seven months. Until the Chittenden low-protein diet is proved to be entirely satisfactory as a permanent diet for healthy individuals it is best not to have recourse to it for long periods in the treatment of diabetes. Temporarily small quantities may be given, but safety lies not far from 1 gram protein to each kilogram body weight.

In the arrangement of the diets of severe diabetics the protein must be restricted to less than 1 gram per kilogram

body weight in order to increase carbohydrate and particularly fat without the danger of acidosis. Protein stimulates the metabolism more than any other kind of food, favors acidosis, and can lead to the formation of 58 grams of glucose for every 100 grams protein metabolized.

It has been claimed that vegetable proteins give rise to less carbohydrate than do animal proteins. As a matter of fact, carbohydrate may be formed out of any protein.

Meat and Fish.—These two articles constitute the chief sources of protein in the diabetic diet. The study of the chemical composition of these foods is simplified for the diabetic patient by the fact that carbohydrate is absent, except in liver and shell-fish. Even in liver the quantity of carbohydrate is almost negligible when we consider the amount and frequency with which this article of food is eaten. The analyses of liver and shell-fish will be found in the tables on pages 204, 208.

The chief difficulty in computing the nutritive value of meat and fish is due to the varying content of fat. Thus, the edible portion of chicken may contain on the average only 2.5 per cent of fat, whereas lean ham may contain 14 per cent of fat, fat ham as much as 50 per cent and smoked bacon 65 per cent, though lean smoked bacon 42 per cent. In general a mixture of cooked lean meats probably contains not far from 10 to 15 per cent of fat.

Fish differs from meat chiefly in the small quantity of fat. Even salmon, which contains more fat than most other fish, showed in its analysis only 12.8 per cent fat, shad 9.5 per cent, and herring and mackerel 7.1 per cent. In general other kinds of fish show 6 per cent or less of fat. Halibut steak, for example, contains 5.2 per cent and cod 0.4 per cent. Preserved fish, however, is quite rich in fat; thus sardines contain 19.7 per cent. In substituting fish for meat, my patients are taught to add from ½ to 1 teaspoonful of olive oil to the diet for each 30 grams of fish. One egg and 30 grams of sardines are convenient equivalents.

The quantity of protein in meat also varies considerably and usually falls as the percentage of fat rises. A value of 20 per cent for protein in uncooked lean meat represents about the average, and this is increased to 25 per cent or

more when the meat is cooked. The quantity of protein in fish is very slightly less than that in meat. Shell-fish make agreeable additions to the diet: (1) They are desirable because they are palatable; (2) they are bulky foods and so are satisfying; (3) they furnish a separate course at a meal. Half a dozen oysters or clams are quite sufficient. The edible portion of a medium-sized oyster on the shell weighs on the average ½ ounce, and half a dozen oysters would amount to about 100 grams. The six would contain about 4 grams carbohydrate, 6 grams protein and 1 gram fat, the equivalent of 50 Calories. Half a dozen clams on the shell (edible portion) weigh 35 grams and contain 0.7 gram carbohydrate, 3 grams protein and a negligible quantity of fat.

Eggs.—Next to meat and fish, eggs are the most frequent source of protein for the diabetic. (These have already been discussed on page 71.)

Cheese.—Cheese is a prolific source of protein and is to be recommended because of its lesser cost. A gram of protein in cheese is considerably less expensive than a gram of protein in the form of meat, fish or eggs. Most varieties of cheese upon the market contain large percentages of fat. Even skimmed-milk cheese may contain as much as 15 per cent. The percentage of protein varies from 18.7 per cent in Neufchatel cheese to 37.1 per cent in Dutch cheese, while the fat varies from 1 per cent in cottage cheese to 38.3 per cent in red American and to 38.9 per cent in Dutch cheese. Therefore, one must not be oblivious of the variety of cheese when eating an ounce of the same.

Broths.—Broths are so extensively used for diabetic patients that their composition deserves notice. Jelly-like broth contains a large quantity of protein in the form of gelatin, and such broths may prevent diabetic patients from rapidly becoming sugar-free when they are consumed freely. As a rule, the nutritive value of a broth made for diabetic patients should be negligible. That this may be the case the broth should be skimmed free of fat and obviously should be clear so as to be free from particles of meat fiber. Various canned bouillons and bouillon cubes contain very little nourishment. (See page 210.) Another danger in broths lies in the amount of salt which they contain. Frequently this is

very great, whereas the amount of salt should be moderate. Patients often desire to drink several cups of broth a day, and if the broth is heavily salted a portion of the salt may not be excreted. If a teaspoonful of salt remains in the body it holds back with it approximately 1 pint of water. This frequently causes temporary swelling of the lower extremities and face, a condition which usually is more annoying than dangerous.

Considerable variety can be obtained in the broths suitable for patients. These are described on page 210.

Fat in the Diabetic Diet.—Fat forms the greater portion of the calories of the diabetic patient's diet. Even with the most modern ideas upon treatment this statement holds. Table 10 gives the proportions which the different foodstuffs hold in the diet and shows the extent to which diabetic patients must depend upon fat to offset the loss of carbohydrate. Remember that the diet of a healthy individual of 60 kilograms (132 pounds) at office work contains approximately 250 grams of carbohydrate, yielding (250 by 4) 1000 Calories. A diabetic patient of analogous weight who fails to utilize more than 400 of these 1000 carbohydrate calories must replace the remaining 600 Calories with 67 grams of fat.

How much fat should a diabetic patient eat? This does not depend upon the capacity of the digestion. The safest answer would be: as little as possible above the normal quantity in order to maintain normal body weight. Unquestionably the quantity will vary from time to time, and it may increase with years without detriment to the patient. Nevertheless, it is reassuring to see a diet which contains more grams of carbohydrate than grams of fat. In other words, a carbohydrate-fat ratio of 2 to 1 or 1 to 1 begets confidence, and a carbohydrate-fat ratio of 1 to 4 or above causes apprehension. Yet Case No. 664, with diabetes of fifteen years' duration, lived upon a diet which contained twice as much fat as carbohydrate, and for years the ratio was nearer 1 to 4 or even 1 to 5. The quantity of fat should never exceed 3 grams of fat for 1 gram of carbohydrate unless the urine is at the same time sugar-free and unless the protein is reduced to $\frac{2}{3}$ gram (0.66 gram) per kilogram body weight. By this means acid poisoning is avoided.

Fat is most agreeably taken as cream, and cream which contains 20 per cent butter fat is usually easier to bear than a richer cream. The upper 120 cc. (4 ounces) of a quart bottle of milk which has stood for twenty-four hours is 20 per cent cream. Cream bought at the market as medium cream contains about 25 per cent butter fat. It is seldom advisable to allow more than ½ pint (240 cc.) of cream, although some patients prefer to increase the quantity of cream at the expense of other forms of fat in the diet. Half a pint of 20 per cent cream contains 48 grams of fat, and yet the quantity of carbohydrate or of protein in cream of this richness is but little over 8 grams and may be estimated in clinical work as 8 grams, or 1 gram to the ounce. A simple method of increasing the amount of fat allowed the patient is to substitute heavy cream for the medium cream. In this way the fat is about doubled. In this vicinity standard heavy cream contains 38 per cent fat. Occasionally patients tolerate butter better than cream and, as a rule, fresh, unsalted butter is preferred. Thirty grams of butter contain 25 grams of fat, and this is a welcome addition to the diet. Oleo, butterine and nut margarine contain no sugar and have about the same percentage of fat as butter, and the cost is very much less. Lard being nearly 100 per cent fat can be used to advantage more than it is now in the diabetic's diet. Crisco, also nearly 100 per cent fat, is often more welcome than lard, because of the lack of flavor. Oil is 100 per cent fat.

Oil is so desirable for a diabetic that it is inadvisable for a patient to take more than 15 grams (1 tablespoonful), lest he weary of it. If oil is disliked upon vegetables, it can be taken in small quantities as medicine after meals. Italian patients naturally bear olive oil unusually well. Olive oil forms an excellent lunch for diabetic patients. It may be used upon retiring It is the diabetic patient's cough medicine and relieves the symptoms of his hyperacid stomach. Peanut, corn or cotton-seed oil may be substituted if expense is a factor. Mineral oil is without nutritive value. One of my patients by error took large doses of olive oil thinking it to be mineral oil and serious symptoms resulted from the surplus food. Cod liver oil is splendid for children.

Cod liver oil is desirable and nearly all my children take 10 grams (two teaspoonfuls) daily.

Danger of Fat to the Diabetic.—Fat is the chief source of the dreaded acidosis, though to this in some degree protein contributes as well. Fat, therefore, at one time may preserve the life of the diabetic, because of its high nutritive value, but at another period may destroy it by causing acid poisoning. How needless this is the statistics of my diabetic children show. In twenty-two months the mortality was 1 per cent per year. Fat in the diabetic diet when properly balanced with carbohydrate and protein is harmless.

Alcohol.—Alcohol does not contain carbohydrate, but the oxidation of 1 gram in the body gives rise to 7 Calories. If enough alcohol is taken to make the diet above the caloric needs, sugar appears in the urine as it would after an excess of protein, or fat.

Theoretically alcohol might appear indicated in diabetes, but practically patients do better without it. One of the reasons why neuritis is far less common among diabetics here than in certain foreign countries is, I believe, largely due to the smaller amount of alcohol consumed. Furthermore, I think it far easier for a diabetic to exercise self-restraint without the use of alcohol than with it. It is certainly not needed in the diabetic dietary.

The pleasure which comes from the practice of medicine has increased materially since the restriction of the use of alcohol in the community and, despite allegations to the contrary, I believe the amount of alcohol consumed is decreasing.

I base this upon my experience as a boy with the workmen in my father's factory in a country town, as a student in college and medical school, as a house officer in various hospitals, as one of many postgraduate medical students in Europe, as a physician attending medical gatherings and as a practitioner of medicine for thirty years. If one partakes of alcoholic beverages I think it unkind to expect all railroad employees and all chauffeurs to abstain. I believe modern machinery and the automobile will remove the alcoholic.

There are few young men, much less young women, or young doctors today who in looking for a job or a practice

want it known that they drink. I do not want any such working for me.

Liquids.—It is rarely necessary to restrict the liquids in diabetes. The diminution of the carbohydrate in the diet with the resulting fall in the quantity of the sugar to be excreted usually leads to a corresponding diminution in thirst and in the volume of urine. A doctor hesitates to restrict a patient with severe diabetes in the use of liquids for fear too little fluid will be available for the body with which to eliminate the acids which may have been formed. On the other hand, patients often upset the digestion by drinking large quantities of liquids rapidly. This is avoided by allowing only half a glass of water at a time, though the patient is instructed to take that as frequently as desired.

Case No. 1196 continually voided large quantities of urine, but investigation usually revealed a cause, such as the ingestion of 20 or more grams of salt, bouillon cubes in variable number or 21 half-grain saccharin tablets a day. Ice water should be discouraged; it may not upset the digestion always, but it does invariably call for the expenditure of calories to warm it to blood heat, and calories for such a purpose a diabetic cannot well spare.

Sodium Chloride.—Salt is of great service to the diabetic patient. If it is withdrawn from the diet the weight falls, due to the simultaneous excretion of water, and the skin and tissues of the patient are obviously dry. When diabetic treatment began with fasting, patients often lost much weight because water alone was allowed. One case lost 13 pounds in four days in this manner. When broths are freely given during fasting it is not uncommon, particularly in the presence of acidosis, to see a patient gain weight, and invariably such patients feel better than those who lose.

This gain in weight is to be explained by the large quantity of salt in the broths. Salt is very freely used by diabetic patients. I do not remember to have ever seen a diabetic patient who took too little salt, though such a case has been called to my attention at another clinic. One of my fasting cases was accustomed to shake salt into his hand to eat. Patients will often salt their broths, although these frequently already contain too much.

The fact that it is harmful for a diabetic patient to take large quantities of salt is occasionally shown by the excessive quantities of urine which they are obliged to void, though sugar-free, and by the swelling in legs and ankles which may appear. However, it should be stated that it is most exceptional for a patient with dropsy to develop diabetic

PHOTO BY BACHRACH

Fig. 30. This college girl, Case No. 1469, developed diabetes when ten years of age. The diabetes was of ten years' duration when the photograph was made in 1928. This year the Manual has been improved through her artistic ability. (See p. 117.)

coma. The withdrawal of salt from the diet of Case No. 1378 wrought surprising changes in her weight and her dropsy entirely disappeared. From 98 pounds it fell to 70 pounds in twenty-five days, and this was due almost exclusively to the disappearance of the dropsy. If the quantity of the urine in twenty-four hours does not exceed 1500 cc. (3 pints) the amount of salt in the diet is seldom, if ever, too great.

CHAPTER X.

THE TREATMENT OF DIABETES WITH DIET AND INSULIN.

Not every diabetic can lead as useful or as strenuous a life as one of the most noted statesmen of our day, now in his eighty-eighth year, who disclosed in an interview that he fought the war and diabetes at the same time. True, it is a fight, but there is pleasure in the struggle. With diet and insulin victory can come to the courageous, and without courage success awaits no one.

Treatment with Diet.—*Eat Less.*—To get rid of the symptoms of diabetes—weakness, loss of weight, thirst, hunger, frequency of urination—one must drive the sugar from the urine. This is done by changing the diet and the use of insulin. If the diabetes is very mild, it may be controlled by eating less of everything, taking more exercise, and reducing body weight to the normal average. This is no more or less than leading a healthier life. Except in very mild forms of the disease such simple measures are not sufficient and hence the quality of the diet as well as its quantity must be altered.

Eat Less Sugar and Starch.—Sugar in the urine comes chiefly from sugar and starch in the food. Therefore, most diabetics must take less sugar and starch (carbohydrate) at their meals. Sugar and starch act almost alike in the body, because the starch of the food changes to sugar soon after it is eaten. If the food is composed of cooked starch, the change goes on very quickly, as one can easily prove for himself by chewing a starchy food for a minute or two, when one may note the development of a sweet taste. Cereals, rice, macaroni, breads, and potato contain so high a percentage of starch that they too change quickly to sugar, whereas the coarser vegetables contain so little starch and this is so

closely mixed with the fiber of the vegetables that its transformation goes on much more gradually. A lump of sugar might be said, figuratively, to *run* into the blood; a tablespoonful of cooked oatmeal, which contains the same amount of sugar as the lump, to *walk* into the blood; the starch in a large dish of lettuce, which is equivalent to the lump of sugar or to the tablespoonful of oatmeal, would be transformed to sugar so slowly in the course of digestion that it would *crawl* into the blood. This is very important, because it explains why diabetics should abhor sugar, leave

FIG. 27.—A child runs as fast as sugar into the blood.
A child walks as fast as starch into the blood.
A child creeps as slowly as the starch in vegetables goes into the blood.

bread alone, take little cereal or potato, rice or macaroni, but eat vegetables freely. One should select those foods which will not suddenly overload the blood with sugar and thus there is less chance for it to escape through the kidneys into the urine.

Eat More Vegetables.—Lettuce, cucumbers, spinach and asparagus are the safest vegetables, because they contain the least carbohydrate. Others follow in order of percentage of carbohydrate such as celery, tomatoes, cabbage and young string beans. These vegetables belong to the group of 5 per cent vegetables. Then come the 10 per cent vegetables—

pumpkin, turnip, squash, beets, carrots, onions, very young green peas. The 15 per cent vegetables are peas, which are more mature, Jerusalem artichokes, parsnips, lima beans. Vegetables which contain 20 per cent of carbohydrate are potatoes, shell beans, corn. (See Table 2.)

Test the Effect of Change in Diet by Examination of Urine for Sugar.—If the change in diet makes the urine free from sugar (sugar-free) and weight and strength are satisfactory the patient is doing well. To know whether the urine is sugar-free the patient should learn to test the urine for sugar. This is easily done and the method is described on page 241.

Balance the Loss of Carbohydrate by Eating More Fat.—Avoid Acid Poisoning by Keeping Urine Sugar-free.—When a diabetic lowers the carbohydrate (sugar and starch) in his diet, he will lose weight unless he makes up for the loss by eating more fat. If he leaves off too much carbohydrate and eats too much fat then he is in danger of acid poisoning, because fat only burns satisfactorily when carbohydrate is also burning in the body. For this reason patients must learn not only what kinds of food to eat, but also how much and the more they know about it, the easier it is for them to live with safety and comfort.

It is not very difficult to learn what kind and how much of the different varieties of food one should take. The carbohydrate is reduced to one-third or one-quarter of that taken in health. The protein (meat, fish, eggs, cheese) would be the same or only a little less than the individual ordinarily eats. The fat would be increased sufficiently, perhaps doubled, to enable the patient to maintain a proper weight. Yet it is not all quite so simple. The diet must be so planned that under all circumstances one important rule shall not be broken, namely, the urine must be free from sugar even if the patient requires insulin for that purpose. (See page 107.)

A Standard Diet.—The following standard diets also described upon pages 172 and 173 can be used at the beginning of treatment. (Standard Diets, Tables 4, 33, 34, pp. 50, 173, 182, also Table 17, p. 102.)

It is easy to add to this standard diet or to subtract from it. In general, however, I like to see the carbohydrate at

least 70 grams and seldom below 100 grams. The protein in it is about right for an adult weighing 132 pounds (60 kilograms) naked. The protein in a diabetic diet should vary from 3 grams per kilogram (2.2 pounds) body weight for children to 1 gram per kilogram for adults and ought to be even less for old people or for those with disease of the kidneys. The fat of a diabetic diet is always the weight preserver of the patient and can be taken freely, always providing the urine is kept sugar-free and the weight of the patient is not above normal. I do not think any of my patients today take over 2 grams of fat for 1 gram of carbohydrate, and most take from 1 to 1.5 grams fat for 1 gram of carbohydrate. With such diets there is no danger of acid poisoning if the urine remains sugar-free.

Division of Carbohydrate between the Three Meals.—The division of the carbohydrate between the three meals is important. The least amount, perhaps one-fifth of the total for the day, should be given at breakfast, leaving two-fifths for each of the other two meals. The reason for this is the fact that at breakfast the diabetes is usually at its worst and becomes milder as the day advances. Why this is so is told in the next paragraph.

The diabetic is most severe early in the morning. He can take less food then without showing sugar in the urine than at any other time of the day. In the morning before breakfast he has very little glycogen (animal starch) stored in the liver. There are two reasons for this. First, during the night the body has been without food from which glycogen could be made, and second, the effectiveness of insulin taken the day before in changing the sugar in the blood to animal starch and storing it as glycogen in the liver and muscles has run out, because insulin only acts for eight hours. Without glycogen in the liver the bodily machine runs less smoothly. Glycogen in the liver of a diabetic is like gold in the bank for a business man. Without capital in the form of glycogen in the liver a diabetic is as badly off as a business man without gold. One can carry the analogy still further. A diabetic without glycogen is as ill fitted to meet diabetic coma as a business man without gold is to meet a business

crisis. Therefore, never try to do a big business in carbohydrate at that time of the day when your glycogen capital is small.

Theoretically the form in which the patient takes his carbohydrate makes no difference, but it makes a great deal of difference practically. If he cannot tolerate 100 grams carbohydrate he should not attempt 20 per cent vegetables, and if he cannot tolerate 150 grams carbohydrate, it is safer not to take bread. Oatmeal contains much carbohydrate, but the patient is tempted but once a day and not so easily as with bread. An Uneeda biscuit or a shredded wheat biscuit contains more carbohydrate by percentage, but these are definite in size and the patient has been taught their values and is more vividly impressed with what he is eating. Bread and potatoes are always indefinite foods, whereas diabetics need to know definitely what they are eating.

The development of the full power of the patient to utilize carbohydrate is favored by diets somewhat low in protein and fat and often one is gratified to see the patients do far better than was at first anticipated. Overeating of any kind of food lowers the power of the diabetic to assimilate carbohydrate. This is one of Allen's great contributions. Elderly diabetics are frequently discharged after a brief hospital stay without the urine becoming quite sugar-free. This is done with the expectation, which experience has justified, that persistence in a diet of slight undernutrition will lead to the disappearance of the slight quantity of sugar in the urine (glycosuria). Time accomplishes what heroic treatment often fails to secure. In reality these patients demonstrate the recuperative power of the insulin-secreting cells of the pancreas, such as one observes after the abatement of an infection or of an injudicious diet which has needlessly brought on acid poisoning.

The amount of carbohydrate given is that which allows the patient to keep sugar-free while at the same time receiving 1 gram of protein per kilogram of body weight with fat sufficient for maintenance of weight and strength. In adults the caloric requirements are about 30 Calories per kilogram

TABLE 14.—THE TREATMENT OF DIABETES IN 1923. CASE NO. 3324, BOY, AGE 12.6 YEARS; DURATION, THREE WEEKS.

Day.	Wgt., lbs., net.	Urine.		Blood sugar, per cent.	Diet.				Insulin, units.
		Diacetic.	Sugar, per cent.		C., gr.	P., gr.	F., gr.	Cal.	
1	76	++	9.0	..	63	23	31	623	0–1–2
2	75	+	2.0	0.21	66	24	37	693	3–4–5
3	76	0	0.1	..	64	46	82	1178	5–5–5
4	78	0	0.1	....	73	44	83	1219	5–5–5
5	79	0	0	..	84	45	84	1272	8–0–7
6	79	0	0	0.10	96	47	84	1328	8–0–7
7	79	0	0		106	47	84	1368	8–0–7
8	80	0	0	.	107	54	89	1445	8–0–7
9	80	0	0		119	55	89	1497	8–0–7
10	81	0	0		131	60	89	1565	8–0–7
11	79	0	0		131	58	89	1557	8–0–7
12	80	0	0		131	58	89	1557	8–0–7
13			..	0.09					

TABLE 15.—DIET AND INSULIN OF H. E. CASE NO. 7578: AGE AT ONSET 47.6 YEARS IN 1929.

Date, 1929.	Sugar, per cent.	C.	P.	F.	Cal.	Weight.	B.S.	Total units of insulin.	Division and time.	
									Units.	Time.
Feb. 3	4.8									
									5	7:30
4	1.3	106	65	93	1521	175¾	0.23	15	5	11:30
									5	4:30
									10	7:30
5	0.5	106	65	93	1521	..	0.11	20	5	11:30
									5	4:30
									8	7:30
6	0.1	108	67	105	1645	..	0.10	23	5	11:30
									5	4:30
									5	10:30
7	Tr.	124	79	115	1847	..	..	15	10	7:30
									5	4:30
8	0.2	140	82	112	1896	..	..	13	8	7:30
									5	4:30

of body weight. If more than 3 grams of fat for 1 gram of carbohydrate must be given, the protein should be lowered to 0.66 grams per kilogram, a figure which is about what the individual of advanced years desires. Theoretically if the urine is kept sugar-free, with as low a protein ration as this the fat can be increased if necessary to four or even five times the carbohydrate. Such a balancing of carbohydrate and fat, with the limitations of protein described, removes the danger of acidosis. In other words the ketogenic-antiketogenic ratio is not exceeded. Insulin has made unnecessary these high carbohydrate fat ratios. It is very exceptional for me to prescribe 2 grams of fat for 1 of carbohydrate, and almost never more than this.

TABLE 16.—DIET AND INSULIN OF H. P., CASE NO. 7580; AGE AT ONSET, 26.6 YEARS IN DECEMBER, 1928.

Date, 1929.	Sugar, per cent.	Diet in grams.				Weight.	Insulin units.	Units and time given.	
		C.	P.	F.	Cal.			Units	Time.
Jan. 30	8.5	80	31	35	759	112	10	5	11:30
								5	4:30
								5	7:30
31	1.3	101	39	60	1110	..	35	15	11:30
								10	4:30
								5	10:00
								10	7:30
Feb. 1	1.2	106	40	65	1179	..	35	5	11:30
								10	4:30
								10	10:00
								10	7:30
2	1.2	106	66	90	1509	..	30	5	11:30
								10	4:30
								5	10:00
								10	7:30
3	0.5	108	68	102	1632	..	25	5	11:30
								5	4:30
								5	10-00
								10	7:30
4	0.3	108	68	102	1632	..	30	5	11:30
								5	4:30
								5	10-00
5	0.8	108	68	102	1632	119	22	12	7:30
								10	4:30

TABLE 17.—INSULIN DIABETIC DIETS.

	Diets.	Total diet.				Carbohydrate (C).					Protein and fat (PF).						
		Carbohydrate.	Protein.	Fat.	Calories.	5% vegetables.	Orange.	Oatmeal.	Shredded wheat.	U-needa.	Potato.	Egg.	Cream 20% fat.	Bacon	Butter.	Meat	
Test	T.D. 1	101	35	43	931	300	300		1	2	120	3	120				1
	T.D. 2	66	24	37	693	300	300		½	2		2	120				2
	T.D. 3	34	15	30	466	300	200					1	120				3
Maintenance	C4+PF4	42	29	52	752	600	200					2	60	30	15		4
	C5+PF5	52	32	66	930	600	200	15				2	60	30	30		5
	C6+PF6	64	44	83	1179	600	200	30				2	120	30	30	30	6
	C7+PF7	74	52	88	1296	600	300	30				2	120	30	30	60	7
	C8+PF8	84	61	94	1426	600	300	30		2		2	120	30	30	90	8
	C9+PF9	98	65	106	1606	600	300	30	½	2		2	180	30	30	90	9
	C10+PF10	109	66	119	1771	600	300	30	1	2		2	180	30	45	90	10
	C11+PF11	135	80	135	2075	600	300	30	1	2	120	2	240	30	45	120	11
	C12+PF12	159	84	135	2187	600	300	30	1	2	240	2	240	30	45	120	12

To save time for doctors and nurses certain standard diets are frequently used at the New England Deaconess Hospital. These are shown in Table 17.

The first three diets, or Test Diets, T. D. 1, T. D. 2, T. D. 3, are really relics of treatment prior to insulin when patients were made sugar-free without the development of acidosis by the reduction of fat and undernutrition. They are still sometimes convenient to use. The foods which compose them are recorded by weight, the carbohydrate (C) in the central portion of the table, and protein and fat (PF) to the right.

The remaining nine diets, or so-called Maintenance Diets, are in routine use at present. It will be observed that each line and number of the Maintenance Diets represents an addition of about 10 grams carbohydrate, as shown for convenience also in the first digit of the grams of carbohydrate until C_{11} is reached. Here there is an increase of 24 grams. To accomplish this increased potato is added to the menu because it is felt that if the patient cannot tolerate 120 grams of potato he had best leave it alone. Similarly the protein and fat values are given, and the foods which make them up. Often it is convenient to prescribe for a patient C_8PF_8 upon entrance to the hospital, and as a routine the nurse gives the diet indicated on the same line. In succeeding days the carbohydrate, protein and fat can be increased. The majority of patients go home with carbohydrate represented by the foods included under C_9 or C_{10} and the protein and fat under PF_{12}.

Treatment with Insulin.—*Who Should Use It.*—If a diabetic is not happy, energetic and a joy to himself and to his family, and his urine sugar-free, he had better take insulin. The chances are overwhelming that it will do him good, and are more than 2 to 1 that at some time or other it will be necessary for him to use it even if only during an emergency. Insulin allows a diabetic to eat more, to work more, to sleep undisturbed, to ward off complications of diabetes. to postpone the coming on of old age and by living long, either largely to outlive the symptoms of diabetes and perhaps to give up insulin or at least to approach more nearly to the

Golden Age when diabetes can be more easily treated or perhaps cured.

Period of Action of Insulin. Insulin acts most powerfully about one hour after it is injected. It is therefore given one-half hour before a meal in order to meet the high tide of sugar in the blood which occurs at one-half hour after a meal. In this way its greatest effect is exerted when the products of the meal are collecting in the blood. Occasionally one gives insulin three-quarters of an hour or one hour before eating, because even before the meal the blood sugar might be above normal and insulin's task is to keep the blood sugar between 0.1 and 0.16 per cent. A normal blood sugar before a meal is 0.1 per cent and it should not rise above 0.16 per cent after taking food. Some patients are forehanded and in consequence take a few (2 to 8) units of insulin at night before they go to bed in order to avoid rising early and injecting insulin as long as one hour before breakfast. By this means they need not inject the morning dose before the usual time.

The effect of insulin wears off in about eight hours. It is seldom given every eight hours, however, because it is needed most in connection with meals when the food is in process of absorption. Frequently it is not required before each meal, because after the early forenoon, when the diabetes is at its worst, the cells of the patient's pancreas may produce enough insulin to take care of all the food prescribed in the diet.

Times of Administration.—When insulin is required twice in the twenty-four hours, it is usually given before breakfast and before the evening meal. The second dose in the day is almost invariably less than the first. Sometimes a small dose is necessary before the noon meal to keep the urine sugar-free. More and more often I am advising patients to take their insulin before breakfast and the evening meal and then if a third dose is necessary to inject that upon retiring. This dose at bed time need be only 2 to 8 units, because it is not followed by food. The advantage of a bed-time dose is that by this means the patients wake up the next morning sugar-free and so begin the day as mild diabetics and everyone

knows it is easier to treat a mild case of diabetes or of any kind of disease for that matter than a severe type.

Rule for Giving Insulin When Food is Not Retained. Insulin lowers the sugar in the blood and theoretically should always be followed soon by food in order to prevent the sugar in the blood from dropping too low and so producing an insulin reaction. However, if the individual cannot take food and the urine contains sugar, insulin is also indicated. Under such circumstances insulin should be given every four hours testing the urine before each dose to be sure it is needed. Never stop insulin because the patient does not eat. Adjust the dose according to the condition of the urine. At the hospital at such times we sometimes write orders as follows: Test urine with Benedict's solution every four hours. If test is red, give 15 units; if yellow, give 10 units; if green, give 5 units; if no sugar, omit insulin, but repeat the Benedict test every four hours until the patient is able to resume his usual diet and insulin.

Insulin and an Infection.—At such times the dose must be increased and, as meals are irregular when one is ill, it is often best to double the number of times insulin has previously been given, so as to take care of all the meals and lunches.

During an infection the effect of insulin wears off more quickly. If a patient has been taking 10 units of insulin twice a day (10–0–10), he might change to 5 units four times a day (5–5–5–5), or he might increase the dose and alternate between 10 and 5 units every six hours (10 5 10–5).

Insulin and Exercise or Diarrhea.—Exercise lowers the blood sugar, because the carbohydrate in the body is better burned up. Diarrhea may lower the blood sugar because the carbohydrate may be less well absorbed or perhaps because less has been eaten. Consequently with excessive exercise or with diarrhea it may be desirable to take a little less insulin or to take a little more carbohydrate, about 5 to 15 grams. This would amount to from 1 to 3 Uneeda biscuits or to a glass of milk.

The Dosage of Insulin.—The individual dose of insulin varies. Quite a number of my patients take as little as 2

units at a time, particularly at bed time, when they do not follow insulin with food. They do this in order that they may wake up the next morning sugar-free and as mild diabetics. One patient lives most successfully when he has 50 units before breakfast and 50 units before his evening dinner. He is eighty-eight years old and strange to say he has never had a reaction from insulin. Most of my patients take 10 to 15 units before breakfast and 10 units before the evening meal. Few take as little as 5 before breakfast save some of the children, few less than 5 before supper. Many take 20 units before breakfast, some even 30, but those taking more than this are as few as those taking only 5 units.

TABLE 18.—DIET AND INSULIN OF J. E., CASE NO. 7572: AGE AT ONSET, 53.3 YEARS IN JANUARY, 1929, DURING AN ATTACK OF RHEUMATIC FEVER.

Date, 1929.	Reduction, per cent.	Diet in grams.				Weight	Insulin units.	Units and time given.	
		C.	P.	F.	Cal.			Units.	Time.
Jan. 17	7.0	62	47	56	940	100	10	5	11:30
								5	4:30
18	0.1	86	52	96	1416	..	25	5	7:30
								10	11:30
								10	4:30
19	0.5	96	65	105	1589	..	30	10	7:30
								10	11:30
								10	4:30
20	0.6	108	67	105	1645	..	30	10	7:30
								10	11:30
								10	4:30
23	*0.4	114	44	109	1613	..	20	10	7:00
								10	4:30
24	0.3	110	69	117	1769	..	20	10	7:00
								10	4:30
26	0	110	69	117	1769	..	20	10	7:00
								10	4:30
31	0	122	71	117	1825	.	10	10	7:30
Feb. 1	0	122	71	117	1825	..	10	10	7:30
2	0	122	71	117	1825	..	5	5	7:30
3	0	122	71	117	1825	..	5	5	7:30
4	0	122	71	117	1825	155¼	5	5	7:30

* Extraction of 5 teeth.

The small doses of insulin do the most good per unit. For example, the first 5 units may enable one to add 1, 2 or more grams carbohydrate per unit, but when one is taking 30 units, an added 5 units would have much less effect. I think it can be said very truly that with intelligence in the expenditure of insulin a little goes a very long ways.

TABLE 19.—CHANGES IN DIET AND INSULIN OF 9 PATIENTS DURING AND SUBSEQUENT TO HOSPITAL STAY.

Case No.	Date.	Sugar in urine, red. %	Diet in grams.			Insulin, total units.	Division of units.			
			C.	P.	F.		M.	A.	E.	N.
4191	July, 1925	0.1	68	57	124	25	15	5	5	
	July, 1928	0	102	56	123	25	15	0	10	
4271	Dec., 1924	0	58	42	120	30	10	10	10	
	July, 1926	0	118	51	108	20	10	0	10	
4285	1924	0.1	78	70	146	8	5	0	3	
	1927	0.1	174	86	132	24	15	0	9	
5701	June, 1927	0	88	66	116	15	5	5	5	
	Aug., 1927	0	88	66	120	15	10	0	5	
6028	May, 1927	0	118	70	119	15	10	0	5	
	Aug., 1927	0.3	145	70	119	0	0	0	0	
6042	May, 1927	0	98	59	121	10	10	0	0	0
	June, 1928	0.2	98	59	121	12	12	0	0	0
6048	June, 1927	0	88	77	136	10	5	0	5	0
	Oct., 1927	0	124	85	141	0	0	0	0	0
6171	...	0	98	67	130	50	20	15	15	0
	...	0	120	65	132	20	15	0	5	0
6191	June, 1927	0	97	69	119	20	10	0	10	0
	Aug., 1927	0	98	67	117	6	6	0	0	0

Insulin should never be omitted when sugar remains in the urine. If vomiting prevents the taking of food, continue the insulin, testing the urine every four hours, and only omit a dose when the urine is sugar-free. I know these two sentences are repetitions, but if they are heeded, there will be no deaths from diabetic coma.

Problems in Treatment.—The illustration on page 109 shows various problems which may occur in the treatment of diabetes with diet and insulin. In the upper row of test tubes the Benedict test is positive in the morning, afternoon,

evening and night specimens of urine. The conclusion is plain. Either the patient is taking too much food or too little insulin. As the patient was not receiving sufficient calories per kilogram body weight, the insulin was increased and the carbohydrate and protein lowered and the fat raised. With another case, showing a similar Benedict test, it happened that the patient had been sugar-free previously with a little insulin, but it had been given up. The result of the tests convinced the patient that insulin was necessary.

In other instances the patients developed infections such as a cold in the head, measles or mumps or a carbuncle and in still others reduced their exercise and as a result sugar appeared in all specimens of urine.

In the second row of tubes in the illustration on page 109 the Benedict test was positive in the forenoon specimen of urine but clear in the afternoon, evening, and night specimens. The patient had enough calories and the questions to decide were: (1) Whether the carbohydrate was divided properly between the three meals; (2) whether the patient was receiving too little insulin before breakfast, because it was after breakfast that the sugar showed; (3) whether the insulin should have been injected one hour instead of one-half hour before breakfast or whether perhaps a very small dose should have been given the previous night; (4) whether he might have been taking too little exercise after breakfast, or should have had ten minutes of gymnastics before breakfast. A study of the chart showed at breakfast he received less carbohydrate than at any other meal. Consequently, it was quite plain that the trouble was not with the carbohydrate at breakfast, and there remained the alternatives: too little insulin before breakfast or not long enough before breakfast or the need for it the previous night or too little exercise before or after the meal. Before changing the insulin, he was advised to take more exercise, and it was found that the sugar disappeared.

Looking at the test-tubes in the third row shown on page 109, it will be seen that sugar was present in the afternoon specimen but absent from all the others. Examination of the chart disclosed that the patient had no insulin before

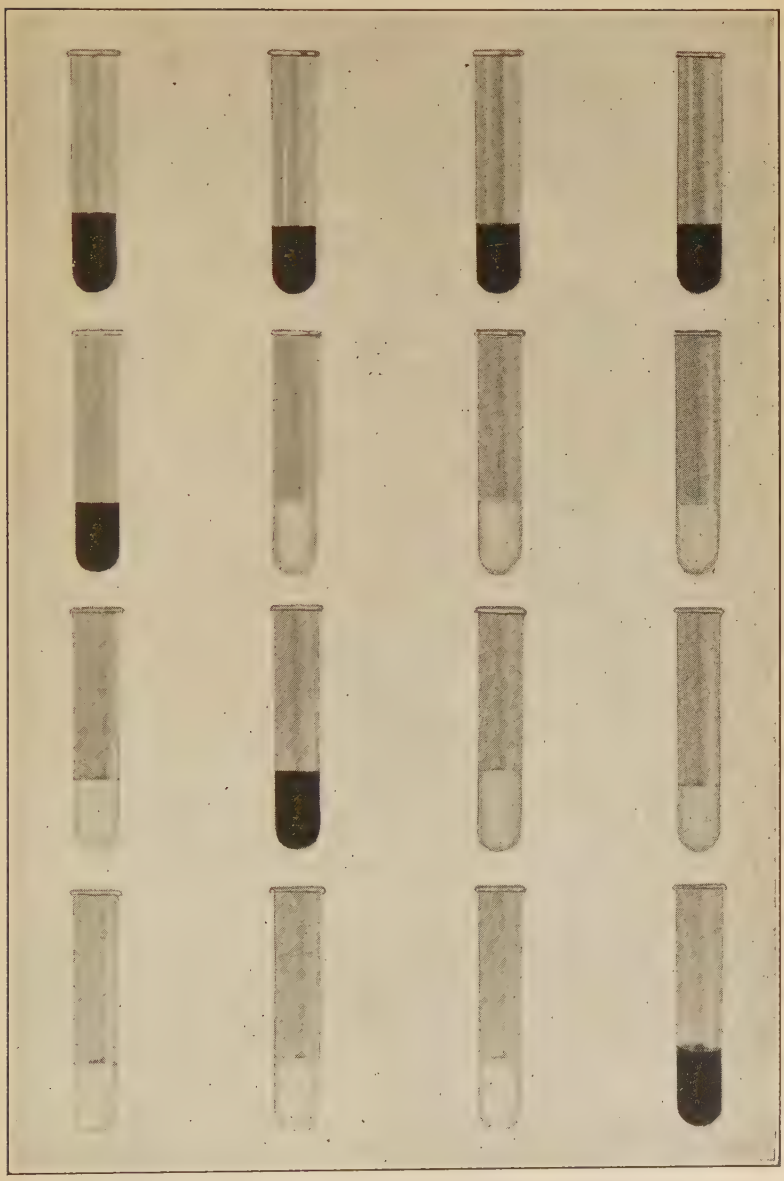


FIG. 32.—The heavily shaded area represents the presence of sugar in the urine at the time of the day indicated.

his noon meal and further that he had as much carbohydrate at noon as at the other meals. Consequently, the first change to get the urine sugar-free for the afternoon was to decrease the carbohydrate at noon and give a little more at breakfast and distinctly more at night.

In the fourth row of the illustration the specimens representing morning, afternoon, and evening showed no sugar, but the night specimen of urine gave a positive test, despite the fact that a good dose of insulin was given before supper. Here the cause for the presence of sugar was found to be different. It is true the patient was taking insulin before breakfast and before supper and that the carbohydrate was satisfactorily divided between the meals, but it happened that the patient had supper at 5.30 P.M. and did not have breakfast until 8 A.M. in the morning. Consequently, he was left without insulin from 5 o'clock at night, when he took his last dose, until 7.30 o'clock the next morning, which was too long an interval. This patient cleared promptly so soon as he had his breakfast a little earlier and supper a little later. This will not always solve the difficulty and at such times it is a good plan to give 2 to 4 units upon retiring.

Instructions for Giving Insulin Subcutaneously.

1. **Sterilizing.**—Wash the hands thoroughly with soap and water.

Wrap the cylinder and the piston of the syringe separately in a piece of cloth and cover them and the wired needle with cold water in a dish, heat to boiling, and let boil for three minutes. Pour off the water, being careful not to touch anything in the dish, and allow to cool by standing.

Paint the top of the insulin bottle with medicated alcohol.

2. **Loading.**—Take barrel and insert in it the piston, being careful not to touch the surface of the piston which enters the barrel and thus contaminate it. After removing wire from needle fasten the latter onto the barrel. Draw out the piston so that the syringe contains a little more air than the amount of insulin needed.

Push the needle cautiously but firmly through the rubber

cap until the point is just seen, invert the bottle; force the air from the syringe into the bottle and then withdraw as much insulin as is desired. By holding the syringe and needle point upward air is easily expelled from the syringe before withdrawing it from the bottle.

3. **Injecting.**—The desirable site for injecting insulin is one where the skin is loose. It is necessary to change the place with every dose. All my diabetics learn to give insulin on the right side of the body in the morning and the left side at night, and in four longitudinal and parallel lines down the extremities. The Sunday dose begins at the upper end of each line and the Saturday dose is at the lower end. Never give insulin many times in one place. Necrosis of tissue occurs, an abscess may form, failure of absorption is bound to ensue, the dosage in consequence is increased and if by chance the same quantity is given in another part of the body a reaction follows.

Having decided on the site for injection, rub gently an area as large as a walnut with alcohol.

Pick up a fold of the skin between the thumb and forefinger of the left hand, and with the syringe held parallel to the skin, push the needle quickly and firmly into the fold nearly up to the butt. The tip of the needle should then feel loose in the soft tissue between the skin and the muscle.

Force the insulin gradually out of the syringe, while withdrawing the needle slowly, so that all of the insulin may not be left in one spot.

Touch the spot lightly with clean cotton until the insulin has been absorbed.

If the insulin has been given too close to the upper layers of the skin a white blister-like elevation will appear.

4. **Cleaning Up.**—Rinse the syringe and needle with cold water immediately. Dry the syringe and needle with a cloth and blow air through the needle repeatedly with the syringe. Rub off any irregularities on the point on a fine stone such as a razor hone. A fine wire should always be kept in the needle.

Certain patients, it is true, do not sterilize their syringes and needles by boiling, but by alcohol. I still hesitate to

FIG. 33.—Injection of air into insulin bottle. (Bowen.)

FIG. 34.—Drawing insulin into the syringe. (Bowen.)

FIG. 35.—The withdrawal of the needle from the rubber cap. (Bowen.)

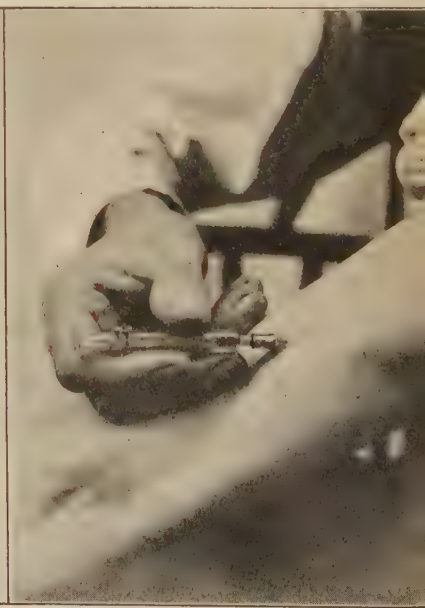


FIG. 36.—The insertion of the needle and injection. (Bowen.)

advocate indiscriminately such a method. I have known of no abscesses to result in the patients who have adopted this method, but these patients were exceptional patients and most deft in their handling of syringe and needle.

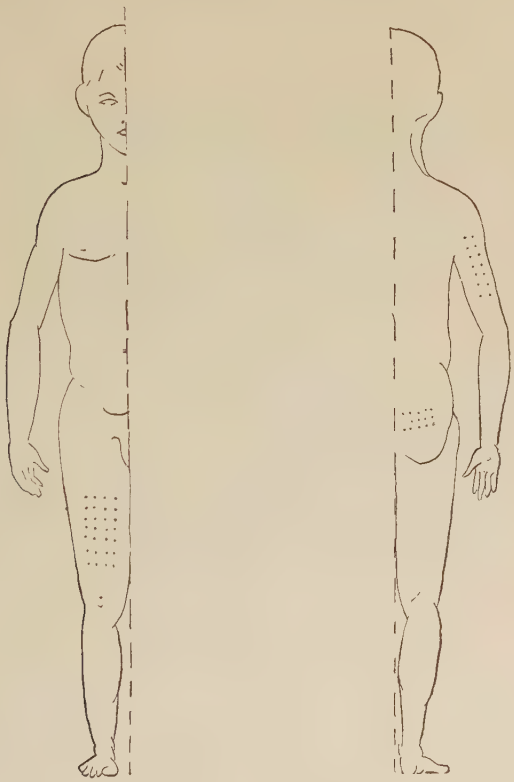


FIG. 37.—Insulin maps.

To sterilize with alcohol pour the alcohol, either pure 95 per cent alcohol or medicated alcohol formula No. 1, into a teaspoon into which the needle has been placed. Wait three minutes. Without inserting fingers into the teaspoon work the syringe into the butt of the needle so that it can be

raised from the spoon, when it can be easily made fast. Expel the alcohol. Dip the cap of the insulin bottle into the spoon containing the alcohol for sterilization and proceed as usual. After injecting the insulin, draw up alcohol from the teaspoon into the syringe and expel it back and forth into the spoon, eventually pouring out all the alcohol from the syringe through the needle and then draw air in and out.

FIG. 38.—Case No. 4702. Age at onset, eight years. Duration, three years seven months. How Barbara takes insulin in 1928. Her first demonstration was before a combined meeting of the New York Academy of Medicine, the Philadelphia Pediatric Society and the New England Pediatric Society at the New England Deaconess Hospital in 1927. (For present diet and insulin see p. 25.)

Diabetes Associated with Disease of Kidney or High Blood-pressure.—Diabetic patients with involvement of the kidney or high blood-pressure should be given low quantities of protein and salt. For these patients one can substitute cream and give the required amount of protein in salt-free meat, because bacon contains too much salt for damaged kidneys to excrete. Fresh butter would be substituted for salted butter and no salt would be added to the food at the table.

Diarrhea.—Diarrhea necessitates an alteration of the diet. Vegetables must be omitted. One large portion of 5 per cent vegetables, usually weighing 150 grams, contains 5 grams carbohydrate or the same as that represented by an Uneeda biscuit, so this is a very satisfactory substitute. Patients allowed 600 grams of 5 per cent vegetables a day simply replace the same with 4 Uneeda biscuits. Oatmeal gruel is another good substitute. A simple substitute for the standard diet would be 1 quart of milk (960 cc.), ½ pint cream (240 cc.), 6 Uneeda biscuits or 50 grams of bread, 1 egg, 1 ounce (30 grams) butter. When a patient is not accustomed to milk it is always a good plan to dilute it. If diarrhea exists, lime water could be employed or an Uneeda could be crumbed into the milk. It is also satisfactorily diluted with Vichy Célestin or Kalak Water.

TABLE 20.—A SUBSTITUTE FOR STANDARD DIET. (See p. 173.)

Useful in the Treatment of Patients with Infections or Digestive Disturbances.

Food.	Carbohydrate, gm.	Protein, gm.	Fat, gm.
Milk, 960 cc. (1 quart)	48	32	32
30% cream, 240 cc. (½ pint)	8	8	48
Uneedas, 6, or bread, 50 grams	30	5	3
Egg, 1	0	6	6
Butter, 30 grams	0	0	25
	86	51	114
Total Calories	4	4	9
	344	204	1026

Case No. 632, a young officer, aged thirty-five years, with diabetes of one and a half years' duration, came to me first in 1913. At the hospital diacetic acid showed repeatedly, and the ammonia was 1.7 grams, but the tolerance for carbohydrate lay between 15 and 30 grams. Nevertheless, he was discharged with 0.5 per cent of sugar in the urine, and diacetic acid was present, with a diet of 30 grams carbohydrate and a limited quantity of protein, though with an unlimited amount of fat. He returned in February, 1916, and it required twelve days to free the urine of sugar and twenty-one days to rid it of acid, but he left the hospital April 13, having been

sugar-free the preceding week, with a tolerance for 28 grams carbohydrate, 79 protein, 133 fat and 9 alcohol. The blood sugar was 0.21 per cent. While at the hospital exercise was utilized to the limit, and obedience was implicit, coöperation ever present and system exact. Permission has been obtained to publish this letter, received eleven months after leaving the hospital in 1917.

March 8, 1917.

"I have really been wonderfully well, feel splendid, and everyone remarks how well I am looking. Tests have shown a slight trace of sugar on three mornings since October 8 last; all other times absolutely sugar-free. My weight doesn't change at all; if anything I have gotten very slightly lighter. I weigh from 122½ to 125½ pounds. I still stick absolutely rigidly to my routine, but I have gotten up to 30 grams carbohydrate per diem — that is, on the last five days of the week I take 30 — rest of diet the same. The last three weeks I have been taking 15 grams oatmeal for breakfast on Monday, Tuesday, Thursday, Friday and Saturday mornings, Wednesday all carbohydrate in 5 per cent vegetables and cream, and Sunday (fast day) all carbohydrate in 5 per cent vegetables."

That this improvement continued is evident from another letter of October 12, 1917.

"We had a patriotic golf match here last Saturday and Monday against the rival golf club here. I was chosen to play 2d for the - - - -, and my opponent and I came out even in both our matches, one over our course and the other over the - - - -. I am sending you a newspaper clipping of the last game at - - - -, just to let you see that there is some life in the old dog yet, Since our game Mr. — — won the club championship of the — —.

"I keep very well, as you may surmise from the above, sugar-free all the time. I stick to the same old routine— 30 to 31 grams carbohydrate per diem. I gave up the orange, as I really prefer the 5 per cent vegetables, and I thought that I took the vegetables better. I had a fine five days the end of September, up in the woods, trout-fishing; had

good weather and very good fishing. I managed to keep sugar-free all the time, although I had a good appetite and took lots to eat."

February, 1918, the patient continued in good condition, sugar-free, with tolerance as before, but by November, 1922, the tolerance had decreased to carbohydrate 15 grams, protein 69 grams, and fat 103 grams, and even then the urine showed a few tenths per cent of sugar. The weight had fallen to 111 pounds; the blood sugar was 0.16 per cent before breakfast.

Insulin was begun and gradually the carbohydrate and fat were raised so that during December, 1922, the patient took and assimilated carbohydrate 40 grams, protein 75 grams, and fat 148 grams.

The dose of insulin has always been small, and even after seventeen months, May, 1924, the patient employs but 10 units once a day. Meanwhile the weight has risen to 123 pounds, and the general condition has correspondingly improved. What a compensation for adherence to treatment throughout an interval of thirteen years.

The above I wrote in May, 1924. At that time even my optimism did not foresee how much more this patient would improve. See Table 6 which shows the extraordinary gain in the last five years.

Illustrative cases are of comparatively little value but what carries conviction are the statistics for children. Before the discovery of insulin the life of the average diabetic child was 2.4 years. Since the introduction of insulin there is no limit to the period a diabetic child can live. In the six years which have elapsed since the use of insulin the mortality for my group of diabetic children has averaged 2 per 100 per year, but in the period September 1, 1926 to July 1, 1928, 6 died—making a mortality-rate in diabetic children of 1 child per 100 children per year. If the lives of children can be saved, there is little excuse for a diabetic adult to be discouraged.

Sixteen of the children have now had the disease over ten years and one of them has allowed me to insert her picture. (See Fig. 30, page 94, Case No. 1469.)

The responsibility for the management of the diet of a diabetic patient should always rest upon one individual. As a rule that individual is the patient, but at times it is another member of the household. Children who are above the age of ten years should be taught to plan their own diets. They readily learn to do this and in so doing make their elders blush. In fact, it is more important for diabetic children to learn what and how much to eat than all the knowledge which their schools afford, for upon this information their lives depend. A child at five years should be familiar with the Benedict test and what a positive test means for him. Perhaps it is because this personal responsibility is so deeply felt in the management of little children that the treatment of diabetes in them proceeds so uniformly and always produces results so much better than are expected. Conversely, the failure of diabetic patients to do well in the open wards of large hospital has been due not so much to the alleged dishonesty of the patient as to the division of responsibility among several nurses. Errors in the diet or in the collection of the urine must be promptly traced to their source.

Diabetic patients whether children or adults should remember that they are not the only members of the family desiring consideration. The children I like and the ones who are happiest take care of their mothers and help them in their work, so that they can always look rested and young.

A letter from a wife to her diabetic husband.

"Shall be most interested to hear of Dr. J's report. I often wonder, dear, if you have always been entirely frank with him as to excessive irritability, etc. I have often thought from the letter you dictated to me that possibly you had only given him details as to health reports and all treatments and symptoms pertaining thereto and not realized some of the other points that might be valuable to him. Please do not throw a brick at me because I am not criticising, only speaking frankly in my keen interest in your health and happiness."

As yet I have not been shown a letter from a husband to his diabetic wife.

CHAPTER XI.

ACID INTOXICATION—ACIDOSIS—DIABETIC COMA.

Acid intoxication used to be the bugbear of doctor and patient. Before we had insulin two-thirds of the diabetic patients and all the diabetic children succumbed to it, but now among carefully treated diabetics it can be completely avoided.

This is due first to the prevention of the causes which lead up to it and second to insulin.

The acid intoxication which develops in a diabetic is no different from that which develops in a normal individual when he stops eating carbohydrate. Under such circumstances when there is no carbohydrate to burn in the body or what amounts to the same thing as in diabetes when the body cannot burn it, the fat burns only to the stage of fatty acids, or to adopt Woodyatt's picturesque phrase, the fat does not burn but smokes. These fatty acids are poisonous, cause acid poisoning (acidosis) and, unless removed, lead to diabetic coma and death.

The invariable cause of acid poisoning is well understood. Overeating brings it on and can lead to death by coma. It makes no difference whether the overeating comes from food which the patient actually eats or whether it comes from his own body tissues which he consumes when he is burning up with fever. Indeed the latter condition is the more serious. Overeating of food is easily corrected, but overeating of one's own body as in pneumonia and similar infections is controlled with difficulty. Inflammatory conditions and certain types of goiter likewise lead to an increased metabolism, *i. e.*, overeating of the body, but most of these may be relieved by surgery.

Diabetic coma always has a reason and the reason is overeating of food or overeating of the body and diabetics should never forget this fact.

A sugar-free urine spells safety for a diabetic. A sugar-free urine implies that he is not overeating, and it is from overeating, from taking more fat than can be burned by the carbohydrate utilized, that acid intoxication results. Danger from acid poisoning vanishes in 999 cases out of 1000 if a diabetic is sugar-free because that shows he is burning enough carbohydrate to oxidize the fatty acids. A given amount of fat may be utilized or burned up, but if too much is given either from the food or from the body it cannot be used up and consequently appears in the urine as acid bodies—the acetone bodies. In other words, if we feed fuel to a fire too rapidly and in too great a quantity it smothers it and it smokes, but if we feed it more gradually, it totally consumes itself and burns up.

Deaths from acid poisoning before the discovery of insulin, decreased with the advent of undernutrition, the reverse of overeating. In my practice this was accomplished by the restriction of fat, which is so rich in calories. Now, however, we know that excessive protein should be avoided as well, because protein tends to increase the metabolism, in other words, proteins fan the food flame in the body and thus lead to the consumption of more food, and the only foods available to a diabetic under such circumstances are fat and more protein. For this reason today the protein in the diet of diabetics is kept at or below the same amount a normal individual would eat and the severer the diabetes the less the protein allowed.

In years gone by when doctors saw diabetics growing thin, it was very natural for them to decrease the carbohydrate to get rid of the sugar, and to allow an unlimited supply of fat to increase the weight. Temporarily this advice would occasionally succeed, but eventually it would end in acidosis and a fatal issue.

Insulin and undernutrition both help carbohydrate to burn, and with the burning of carbohydrate in the body, acidosis vanishes like dew before the sun. No wonder there-

fore that there are less cases of diabetic coma today. There need be none if care is taken in the diet and insulin is used in season. On the other hand if the patient has been taking a diet more than would be possible for him to take and keep sugar-free without the use of insulin and then suddenly omits his insulin and continues to eat the same amount of food, diabetic coma can occur with surprising swiftness. A diabetic is walking on insulin stilts. Take away the stilts and he falls. Never omit insulin when sugar is present in the urine even if you are not eating or retaining food.

A diabetic boy overeats at Thanksgiving on Thursday. If he breaks his diet that day it is fairly good evidence he has broken it before. Upon Friday and Saturday he may have indigestion and vomiting. Not caring for food perhaps he neglects insulin and feels "sick." He is irritable, thirsty, but does not keep down the food he takes, his bowels are neglected. He feels weak and loses interest, becomes sleepy and stuporous and breathes heavily with air hunger. Before anyone realizes the fact unconsciousness develops and only the miracle working action of insulin will save him.

Signs of the onset of acid poisoning are most indefinite. Consequently, it is a good rule for any diabetic patient if he feels ill, and always if he has fever, to take for granted that he may have acid poisoning and adopt those measures which will prevent its becoming serious. These are very simple, and are as follows:

Treatment of Acid Intoxication. Rules for the Patient.

1. Send for the doctor.
2. Go to bed.
3. Keep warm: flannel nightclothes. Heaters, but put a blanket about the heater to avoid burns.
4. Take an enema. The enema clears the lower intestine so that salt solution, a teaspoonful of salt to each pint of water, can be given later by the rectum in case liquids are not retained by mouth. Prepare 3 pints of boiled water as the doctor may wish to use it when he arrives.

5. Liquids. A cupful an hour. Hot water, tea, coffee, broths, water-oatmeal gruel, orange juice.

6. Secure a nurse or someone in the family who will spend her entire time caring for the patient until the doctor arrives.

Treatment of Acid Intoxication. Questions for the Doctor.

1. Has this patient acidosis and is it severe enough to account for his present symptoms?

2. If so, how much and how frequently is insulin to be given? Ten, 20, 30, 40, 50, or more units? Every half hour or every hour? What does the urine or blood indicate?

3. Is the patient dry? Does he not need immediately a quart of salt solution injected under the skin and later another pint?

4. Is the stomach dilated? Does it demand lavage?

5. Does the heart need caffeine, $7\frac{1}{2}$ grains in repeated doses, or other stimulation?

In the convalescence, patient, and physician too, will do well to make haste slowly. Carbohydrate up to 50 grams however should be given and retained and absorbed by the patient during the first day. This will suffice for temporary nutrition with the gradual addition of protein and fat as rapidly as the stomach will bear food. If carbohydrate is not retained 25 to 50 grams of glucose must be given intravenously or subcutaneously.

TABLE 21.—ACIDOSIS WITHOUT COMPLETE COMA. CASE NO. 6030.

Hour.	Diacetic acid.	Urine, sugar %.	Blood sugar.	Blood CO_2, vol. %.	Insulin, units.	Ginger ale, cc.	Orange, cc.	Milk, cc.	Oat-meal, cooked, gms.	Broth, cc.	ORDERS.
10	++++	9.0	0.44	32	10						Insulin, 10 units every half hour for 4 doses.
					10						Test urine at 1:00 o'clock, 6:00 and 10:00.
11	+++	5.0	..	..	10						If Benedict test is red give 20 units.
NOON					10	50					" " " orange " 15 "
12	....	..	..	..	..	..	50				" " " yellow " 10 "
1	....	..	..	..	..	50					" " " green " 5 "
2	+++	4.5	0.17	49	15	..	50	..	..	100	
3	....	..	..	..	..	..	50				Enema.
4	....	..	..	..	..	50	..	120			Warm fluids, not over 100 cc., every hour p.o.
5	....	..	..	..	..	..	..	60	120		Four hourly temperature chart.
6	+	1.4	..	..	10	50					
7	....	..	..	..	..	..	..	120			
8											
9											
10	0	0.3	..	..	5						

TABLE 22.—DIABETIC COMA (CASE NO. 4099). RESULT OF TWELVE HOURS OF TREATMENT (EXTREME HYPERGLYCEMIA).

Time.	Urine.		Blood sugar, per cent.	Non-protein nitrogen, mg. per 100 cc.	Blood carbon dioxide, per cent volume.	Insulin.	ORDERS.
	Diacetic acid.	Sugar.					
6:00 A.M.	++++	Red	1.60	140	13	20	(*a*) External heat.
						20	(*b*) Urine specimens every hour (retention catheter).
7:00	++++	Red	....	...	..	20	(*c*) Insulin: 20 units every half hour until specimens
						20	become yellow, unless order is changed.
8:00	+++	Red	1.38	103	18	20	(*d*) Hypodermoclysis with 1000 cc. of salt solution,
9:00	+++	Red	....	...	..	20	with 1 cc. of 1 to 1000 adrenalin, repeat after
10:00	++	Red	....	...	..	20	four hours.
11:00	+	Red	0.79	80	24	20	(*e*) Salt solution, 6 ounces (178 cc.) by rectum every
12:00	+	Red	....	...	..	20	four hours.
1:00 P.M.	+	Orange	....	...	..	20	(*f*) Gastric lavage with warm water.
2:00	Trace	....	....	...	..	15	(*g*) Caffeine sodiobenzoate, 7½ gr. (0.5 gm.) every
3:00	0	....	0.36	80	37	5	three hours for 3 doses.
4:00	0	Green	....	...	..	0	(*h*) Warm liquids by mouth, water broth, etc., 150 cc.
5:00	0	Green	....	...	..	0	every hour, as soon as condition permits.
6:00	0	0	0.13	78	48	0	(*i*) Carbohydrate, 100 gm. as liquids in next eighteen
							hours.

Onset of diabetes in a girl aged seventeen years, in 1923. Following three days of irregular dieting and careless use of insulin in 1927, coma developed. Recovery was prompt and joy reigned, because hitherto no one with so high a blood sugar in coma had survived. I – – a became a good patient and has had no diabetic complications according to her letter of February 7, 1929.

CHAPTER XII.

THE DIFFERENCES BETWEEN DIABETIC COMA AND INSULIN REACTIONS.

Diabetic coma is due to acid poisoning, is serious, and if untreated leads to death. It is caused by overeating, often by breaking the diet, by omitting the insulin which has allowed the regular meals, or may occur from overeating in the course of fever and infections or in some kinds of goiter when the patient overeats of himself. Coma is preventable. (See p. 119.)

Table 23.—History, Symptoms and Signs, Differential Diagnostic Points Between Diabetic Coma and Insulin Reactions.

	Diabetic coma.	Insulin reactions.
1. Onset	Slow, days	Sudden, minutes.
2. Food	Too much	Too little.
3. Insulin	Too little	Too much.
4. Presence of an infection	Usual	None.
5. Thirst	Extreme	Absent.
6. Hunger	Absent	Frequent and extreme.
7. Vomiting	Common	Seldom.
8. Pain in abdomen	Frequent	Absent.
9. Fever	Frequent	Absent.
10. Skin	Dry	Moist.
11. Tremor	Absent	Frequent.
12. Vision	Dim	Double.
13. Appearance	Extremely ill	Weak and faint.
14. Respiration	Exaggerated (air hunger)	Normal.
15. Mental state	Restlessness and gradually approaching unconsciousness	Occasionally excited with gradually approaching unconsciousness.
16. Urine sugar	Present.	Absent and always absent in the second of 2 specimens.
17. Response to treatment	Gradual improvement in hours with insulin	Sudden improvement in minutes with carbohydrate by the mouth, rectum, intravenously or subcutaneously.

Insulin reactions are explained by the blood sugar falling too low. This may be due to too much insulin, to the taking of too little food after the injection of insulin or its poor absorption due to vomiting and diarrhea, or to so much exercise that the food eaten has been used up. Insulin reactions almost never cause death but can be serious, because they may occur in places where they are embarrassing or dangerous to the patient. They can be prevented by taking a little carbohydrate when the first warning signal appears. (See p. 38.)

Diabetic coma is always avoidable by following the rules of treatment. An insulin reaction may occur accidentally, but is usually preventable.

FIG. 39.—Case No. 4688. Age at onset four years, duration to December 1928, four years, five months. "Toy is so happy that I do not believe he draws Irene far." Recent diet, carbohydrate, 74; protein, 48; fat, 74. Insulin 16–6–10–4. Irene is too fat and her weight does not correspond with the calories of the diet. Investigation of any such discrepancy is always indicated. Occasionally with a child or adult the basal metabolism is higher in calories than the diet is supposed to contain. In such instances the information obtained from a test of the metabolism is most valuable in readjusting treatment.

CHAPTER XIII.

CARE OF THE TEETH.

Diabetics generally have poor teeth, not because they have diabetes, but because diabetics are old rather than young and the teeth have been neglected. In one series of 300 patients nearly one-half had poor teeth or none at all. It is my impression that the teeth of diabetic children are as good as those of any group of children.

Good teeth are an asset to a diabetic, because the diabetic diet is a coarse diet consisting largely of green vegetables and these must be masticated thoroughly to avoid indigestion. Bad teeth are a handicap to a diabetic, because the infection which accompanies them makes the diabetes worse. Bad teeth are worse than no teeth. A diabetic cannot afford to tolerate anything which makes his disease worse, consequently he should get rid of all the poor teeth which proper treatment cannot save. So important do we believe this to be at the Deaconess Hospital that a Dental Hygienist examines the teeth of all diabetic patients and makes a preliminary report to the dentist who later advises as to extractions. I never feel easy if a patient is discharged with an abscessed tooth.

Extraction of teeth in a diabetic is a simple affair if performed by a competent dentist and by one who is acquainted with diabetes. Such a dentist knows that injury to the gums of a diabetic should be reduced to a minimum, thereby averting the opportunity for a fresh infection. If the teeth can be removed easily, and are infected, there is no reason against taking out as many as fourteen at a single sitting. In fact Case No. 3335, Mrs. —— had this number removed one day and stood up in the diabetic class the next morning, so that all might see that though seventy-eight years of age she had experienced little discomfort.

Extractions are performed with novocaine, care being taken to avoid extensive infiltration of the tissues, or with gas-oxygen, which is very satisfactory, but ether is contra-indicated unless the patient is protected with insulin.

Time spent in a hospital by a diabetic to get sugar-free and learn the diet should be utilized to have the teeth put into perfect condition. There is no question but that removal of infections about the teeth is advantageous and helps raise the tolerance for carbohydrate. The infections may be slight, yet, if allowed to persist, they prevent the patient utilizing the food he would be very glad to eat. How injurious any form of infection is to a diabetic any mother who has a diabetic child knows, because sugar in the urine promptly appears so soon as a slight cold is contracted. Tolerance for the diet on which the patient has lived for months and on which he has been sugar-free falls under such circumstances.

One of the advantages to the patient in having a chronic disease like diabetes is the detailed attention which his body receives from his physician. The neuritis and the pains in various parts of the body which used to be attributed to diabetes were probably quite independent of the disease and brought on by other causes. The health examinations which a diabetic should receive at each visit should protect him against many ills which non-diabetics thoughtlessly acquire.

A diabetic should see his dentist every three months. In addition to the cleaning and treatment of the teeth, in most instances it is desirable, if above the age of fifty years, once a year to have an Roentgen-ray examination of the teeth. Over and over again trouble is found in this way which otherwise would not have been detected.

The mouth should be thoroughly rinsed out after each meal and the teeth cleaned at least twice each day.

CHAPTER XIV.

CARE OF THE SKIN AND FEET.

Importance of Keeping the Skin Clean and of Prompt Treatment of the Slightest Injuries, Particularly of the Feet.—Gangrene caused 1 in 5 of the fatal cases of diabetes in Boston between 1895 and 1913. Over one-half of the fatal diabetic cases in four large Boston hospitals during 1923 were due to gangrene and infections. The overwhelming majority of all such deaths are needless and could be prevented by cleanliness, proper care of the feet, and early treatment of all wounds, insignificant though they are in the beginning. Exceptionally gangrene will develop because of the closure of a bloodvessel and without any abrasion of the skin having occurred. Cleanliness is here not a factor. Each patient treated at the Deaconess Hospital is told to protect the reputation of the institution and its doctors by avoiding death by gangrene. To aid in accomplishing this object we have at the Deaconess Hospital a beauty parlor.

The prevalence of complications in the feet with the prolonged hospital stay which they involved led to the establishment of the Beauty Parlor for Diabetic Feet. It has amply repaid the generosity of the donors, Mr. and Mrs. William L. Shearer, by the good it has done. The work performed has steadily grown and in 1928 the services of one of our chiropodist friends was secured. He not only helps us greatly with our patients, but has spread the knowledge of the vulnerability of the feet of diabetics among his associates and their diabetic clients.

An infection makes the diabetes worse. When case No. 3589 had a septic arm, 90 units of insulin failed to keep the urine sugar-free; when the infection was removed, sugar disappeared though the insulin was reduced to 30 units and carbohydrate and calories were increased. It makes little

difference whether the infection is general, as in pneumonia, or local, as in the case of a boil, a carbuncle, an abscessed tooth, an infected finger or toe, an inflamed appendix or gall-bladder. Therefore, all infections should be promptly and energetically treated.

The skin of a diabetic should be kept exquisitely clean. A diabetic should be recognized for his clean skin and clothes. If the feet are kept as clean as his face, gangrene and infections will seldom occur. With patients over fifty years of age it is usually more important to look at their feet than their faces. The sheet of instructions which we give to each patient is printed below.

Hygiene of the Feet.—1. Wash feet daily with soap and water. Dry thoroughly, especially between toes, using pressure rather than vigorous rubbing. Never step on the floor with bare feet.

2. When thoroughly dry, rub well with hydrous lanolin as often as necessary to keep skin soft, supple, and free from scales and dryness, but never render the feet tender.

3. If the feet become too soft, rub once a day with alcohol.

4. If nails are brittle and dry, soften by soaking in warm water one-half hour each night and apply lanolin generously under and about nails and bandage loosely. Clean nails with orange-wood sticks. Cut the nails only in a good light and after a bath, when the feet are very clean. Cut the nails straight across to avoid injury to the toes. If you go to a chiropodist, tell him you have diabetes.

5. Wear shoes of soft leather which fit and are not tight (neither narrow nor short). Wear new shoes one-half hour only on the first day and increase one hour daily.

Treatment of Corns and Callosities—1. Wear shoes which fit and cause no pressure.

2. Soak foot in warm, not hot, soapy water. Rub off with gauze or file off dead skin on or about callus or corn. Do not tear off. A corn may be painted with the following mixture: salicylic acid 1 dram, collodion 1 ounce. Repeat for four nights; then, after soaking in warm water, the corn will come off easily. If it does not come off easily without bleeding, repeat the treatment for four nights.

3. Do not cut corns or callosities.
4. Prevent calluses under ball of foot.
   (*a*) By exercises such as curling and stretching toes twenty times a day.
   (*b*) By finishing each step on the toes and not on the ball of the foot.

Aids in Treatment of Imperfect Circulation.—*Cold Feet.*—1. Exercises. Bend the foot down and up as far as it will go six times. Describe a circle to the left with the foot six times and then to the right. Repeat morning, noon, and night.

2. Massage with lanolin or cocoa butter.

3. Do not wear circular garters. Do not sit with knees crossed.

Treatment of Abrasions of the Skin.—1. Proper first-aid treatment is of the utmost importance even in apparently minor injuries. Consult your physician immediately.

2. Avoid strong irritating antiseptics, such as sulphonaphthol and iodine.

3. As soon as possible after injury certain surgeons recommend the application of sterile gauze saturated with medicated alcohol or hexylresorcinol (S. T. 37). Keep wet for one hour by pouring on more alcohol or S. T. 37. Sterile gauze in sealed packets may be purchased at drug stores.

4. Elevate, and as much as possible until recovery avoid using the foot.

5. Consult your doctor for any redness, pain, swelling or other evidence of inflammation.

Itching.—Pruritus pudendi (itching of the genitals) frequently occurs in diabetes and will usually vanish within a few days, but occasionally not until two weeks after the disappearance of sugar from the urine. General pruritus, on the other hand, is exceptional, may be annoying and persist for weeks. It does not occur in young diabetics. If local pruritus does not clear up promptly, as the urine becomes sugar-free, an examination will probably disclose a prolapse, leucorrhea or urinary incontinence. Rest in bed, absolute cleanliness, simple douches and the simplest of ointments are indicated. The free use of oil to prevent irritation during

micturition is helpful. There may be cases where $\frac{1}{4}$-skin doses of Roentgen-ray become necessary to allay the itching.

Epidermophytosis.—Certain of the angry eruptions seen about the genitals, buttocks, in the groins, armpits, under the breasts or between the toes are due to an infection with a special organism (epidermophyton). This condition is best treated by a skin specialist. It is of increasing importance in the feet because it softens the skin and makes it susceptible to slight injuries and secondary infection. Certain physicians recommend painting the milder lesions between the toes with mercurochrome 2 per cent solution twice a day. In more severe cases the following ointment has been employed.

Thymol	0.75
Salicylic acid	1.20
Benzoic acid	2.50
Petrolatum	ad 60.00

Boils.—If there is the slightest tendency to boils, furunculosis, at once adopt simple measures analogous to those described by Bowen.[1] The patient is advised to wash the whole body twice a day with soap and water, using a fresh piece of sterilized gauze and powdered or liquefied soap and to dry the skin with a freshly boiled towel without rubbing, so as to avoid breaking open any pustule; the whole body is then bathed with a saturated solution of boracic acid in water, with the addition of a small proportion of camphor water and glycerin. I have often advised a solution of 2 parts medicated alcohol No. 1 and 1 part water to advantage, but I notice that Bowen, in his second paper, still prefers the boracic acid. Individual furuncles may be treated with the following ointment, according to Bowen:

Boracic acid	4
Precipitated sulphur	4
Carbolated petrolatum	30

One should be careful, however, not to overtreat the skin. Harm may result from frequent dressings. The simplest lotions should always be employed. In severe cases the

[1] Bowen: Jour. Am. Med., 1910, **55**, 209; Boston Med. and Surg. Jour., 1917, **176**, 96.

patient should be put to bed, all linen changed twice daily, and the patient treated in as aseptic a way as possible. In a few cases vaccines have appeared to be of marked benefit. "This procedure—thorough bathing and soaping, the application of the borated solution and the dressing of the individual furuncles—is repeated, as has been said, morning and night. A further point of vital importance relates to the clothing that is worn next to the skin. Every stitch of linen worn next to the skin should be changed daily, and in the case of extensive furunculosis all the bedclothing that touches the individual, as well as the nightclothing, should be subjected to a daily change. Naturally, this treatment must be continued for several weeks after the last evidence of pyogenic infection has appeared, and this fact must be emphasized to the patient at the outset." (Bowen.)

"The washed neck, like the watched pot, never boils. (Brigham.)

Carbuncles.—Carbuncles are similar to boils, but more serious. They should be treated invariably by a surgeon from the start. A very, very few may heal by Roentgen-ray treatments without operation. Carbuncles are dreadfully dangerous of themselves and because they make the diabetes so much worse.

CHAPTER XV.

SURGERY IN DIABETES.

Every other diabetic is operated upon during the course of his disease. Diabetics are just as liable to diseases requiring the surgeon's help as non-diabetics and, indeed, rather more so, because infections make a diabetic worse and it is imperative to get rid of them. Gall stones are common in diabetics and probably 30 per cent of those above twenty-five years of age have them. Appendicitis occasionally occurs and is easily confused with diabetic coma. Diseased tonsils and abscessed teeth require removal. Carbuncles are serious, but if treated early the mortality is much lessened. The most common surgical ailments are those of the lower extremities due to gangrene or chronic infections involving the bone. Such conditions begin unobtrusively in elderly people, because old people's feet are not sensitive and so injuries, whether from shoes or from burns, cause little pain. If neglected, these abrasions, cuts, cracks or burns of the skin become infected and burrow deep into the tissues and joints because the resistance is low, due to poor circulation, and as a result necessitate amputation. Picking, cutting, or tearing a callus or a corn, or pricking a blister may lead to such an infection. Corns on the upper side of the toes are especially dangerous, because so often these become infected and the joint in turn is involved. This usually necessitates removal of the toe, and as healing progresses slowly, or even may fail in a diabetic's foot, there is opportunity for the infection to spread to the remainder of the foot with eventual amputation of it or even of the extremity higher up.

If a diabetic washes his feet every night, he will discover trouble with the feet early, should it occur. Corns and calluses will be softened and can be rubbed off with gauze.

Do not prick a blister. Put that responsibility upon the surgeon. The majority of the surgical diabetic beds at the hospital are still filled with patients who have gangrene or infections of the feet, and these are really to a large extent needless. Do not add to this pathetic, but very often brave, army.

Modern surgery makes the surgery upon diabetics safe and insulin allows any type of anesthesia which is necessary. Doctor and surgeon, however, must work hand in hand to get the most successful results. It is wiser to operate when the urine is sugar-free, but it is wrong to put off an operation, even if not sugar-free, should the surgical condition be getting worse. Insulin is given according to the need and, as meals are irregular, more by the hour than by the day, depending upon the state of the patient. One tries to keep the urine sugar-free, but this is not usually possible for a day or two following operation.

I call the surgeon the diabetic's friend. It is the surgeon who cures the infections which make his disease worse, extracts his bad teeth and poor tonsils, takes out his gall stones or thyroid which in some cases almost leads the diabetes to disappear, removes his appendix, and finally it is the surgeon who often can relieve the diabetic from the suffering of gangrene by the amputation of his leg. Without a surgeon's aid one-third of my hospital patients would needlessly die.

If a needle breaks and is left under the skin while injecting insulin, do not be alarmed. The needle will not wander. Mark the site by drawing a circle about the point of injection. Draw an arrow in the direction the needle was inserted. Then when a convenient time arrives ask a surgeon and not a doctor like myself to take it out. He will probably desire a Roentgen-ray picture. Betty learned more self control when a needle was taken from her arm than in all her life before and incidentally found her surgeon was a true friend. The removal is not painful, but it is not so easy to find a needle as one might think.

CHAPTER XVI.

TREATMENT OF CONSTIPATION AND DIARRHEA.

CONSTIPATION.

The bowels should move daily. To this end nothing compares in effectiveness with the cultivation of regular habits and hours for this purpose. Time is required, and one-half hour, or even more, assigned to the toilet at the same time of the day for three successive days will often bring relief from constipation and this will persist for months. The coarse vegetables and fruits of the diet may prove quite sufficient, but it is essential to impress upon the patient the necessity of preparing coarse vegetables in a simple manner. It is perfectly possible to cook cabbage, cauliflower, turnips, parsnips, radishes, cucumbers and onions so as to be unirritating to the digestive tract and yet preserve their laxative qualities. If necessary bran muffins (see pages 175, 176 and 185) and agar-agar jellies (see page 180) may be employed. Caution, however, should be exercised in the use of bran or temporary intestinal obstruction may result from its collection as a dry mass in the rectum which necessitates its removal by hand. Mineral oil used in place of olive oil as an ingredient of mayonnaise salad dressing is excellent. (See pages 192 and 193.) If potatoes are included in the diet, the baked potato skins may solve the difficulty. Never purge the bowels, but depend upon an enema or upon simple laxatives, such as aloin, grain $\frac{1}{5}$; fluidextract of cascara sagrada, 10 to 30 drops; extract cascara sagrada, 5 grains. The ordinary compound rhubarb pill, obtainable in any drug store, is the cathartic most in use at the Deaconess Hospital. These are very satisfactory. In certain rhubarb pills the presence of peppermint or salicylate may lead to the excretion in the urine of an acid and thereby give rise to an unwarranted

report of acid poisoning. (See page 244.) This is no deterrent to their use.

Citrate of magnesia in liquid form is contraindicated. In one preparation examined there was found 11 per cent of sugar. The amount of sugar in one bottle was more than 2 tablespoonfuls.

If the patient has not had a movement for several days, at the beginning of treatment give an enema and follow by some simple cathartic or mild aperient, and then give another enema twelve to twenty-four hours later; but do not purge the patient. Gain enough is obtained if a movement is produced once in twenty-four hours when it has only been taking place once in seventy-two. In other words, do not upset any patient who is in a tolerable state.

The following exercises for constipation were recommended to me by Mr. Gustaf Sundelius:

1. **Abdominal Kneading and Stroking.**—*Kneading.*—Lying down, with knees slightly drawn up, place hands one on top of the other on the abdomen at the right groin; with small circular movements and deep pressure work upward until the ribs are met, then across toward left, following the boundary line of the chest, then downward to the left groin. Repeat 20 to 50 times. *Stroking.* With hands similarly placed, make long, steady and deep strokes, following the same route. Repeat 25 to 100 times.

2. **Leg-rolling.**—Lying down, take hold of both legs just below the knees, press the knees up close to the abdomen, then carry them apart, then down and inward until they meet again, thus letting the knees describe two circles. Repeat 10 to 20 times.

3. **Abdominal Compression.**—Standing against the wall with hands clasped behind neck, draw the abdomen forcibly in, using the abdominal muscles, hold a second, then let go. Repeat 10 to 40 times.

4. **Trunk-rolling.**—Standing with hands on hips, feet apart and legs well stretched, roll the upper body in a circle on the hips by bending forward, to the left, backward and to the right. Then reverse, and repeat 6 to 12 times each way.

Case No. 559 warded off constipation by sawing wood, and

Case No. 265 regulated his bowels by eating a slice of raw cabbage for breakfast. This is one of the reasons why cabbage next to lettuce is the most useful diabetic vegetable.

DIARRHEA.

The reverse of constipation, diarrhea, is rare in diabetes. It is a serious complication. When it occurs the patient should go to bed immediately, keep warm and live upon hot water, hot weak tea and strained oatmeal gruel which is thoroughly cooked and made with water. The 1 ounce, 30 grams, of dry oatmeal used for breakfast will make 1 pint of gruel. Temporarily being without food for a few hours is allowable, but this should not go on for long. The carbohydrate of the diet should be continued in the simplest form, such as gruels, crackers, toast, rice, macaroni, or even grape juice or ginger ale. For their carbohydrate content see food tables, page 204. See also Table 20 for the equivalent of the standard diet in simple and unirritating form. The return to the diabetic diet is rendered easy by the use of cottage cheese, soft cream cheese, lean meats, oatmeal, milk, cream, biscuits, eggs, purée vegetables. The carefully prepared, tender vegetables are frequently better borne than a diet containing considerable quantities of albuminous and fatty food.

If liquid is not retained by mouth it may be necessary to give salt solution subcutaneously. If there is any suggestion of undigested food remaining in the stomach this should be removed by lavage or induction of vomiting. The lower bowels should be cleared with an enema. A Seidlitz powder may be given to clear the intestines. The physician may administer an opiate or he may give a teaspoonful of bismuth subcarbonate before each meal and after each loose movement. Rest in bed is the essential and the best sort of treatment.

Diarrhea may necessitate the decrease or the increase of insulin. As a result of the loose movements, the carbohydrate of the food is less well absorbed, and in consequence the insulin has less carbohydrate upon which to act and an

insulin reaction may take place. On the other hand, with vomiting and diarrhea the body is forced to depend upon its own protein and fat for nourishment and may consume so much of these without any carbohydrate at the same time that acid poisoning takes place, and this can easily go on to coma. In the presence of acidosis insulin acts less efficiently and hence the demand for an increase in the dosage of insulin.

Upon all such occasions it is safer to give the insulin more frequently, but in smaller doses. Thus, if one has been giving the insulin three times a day in 10-unit doses one can change to six times a day in 5-unit doses. Occasionally sugar persists in the urine, and it may be necessary to increase the dose again to 10 units for a few times or if the urine is constantly sugar-free to omit one or more doses.

Diarrhea and fasting were the weapons used by Guelpa to get his patients sugar-free, and they were most efficacious. Consequently, when these conditions occur by chance in a patient caution is demanded or else a little insulin will produce an unexpectedly great effect.

Diarrhea in any diabetic is dangerous. Call the doctor.

CHAPTER XVII.

HEREDITY AND MARRIAGE.

One in 4 of my diabetic patients as a group and one in 3 of the children have a relative with the disease, and of those children who have already had diabetes for ten years, nearly every other one (44 per cent) is related to another diabetic. Let diabetics live long enough and I suspect the majority will find another diabetic in the family. If you have an ancestor with diabetes do not become forty and fat, and if you are a diabetic put this same rule in force among your relatives and teach your descendants to avoid obesity. By this means much of the element of heredity can be overcome.

Shall a diabetic marry? It is more dangerous for a woman than a man. Fortunately diabetes is ten to thirty times as common after the age of forty-five years as under forty-five, and, therefore, the possibility of the transmission of diabetes is reduced.

No diabetic girl or boy should get married (1) unless the parents of the non-diabetic have been told that the other has diabetes; (2) unless sufficient capital is available to provide for a "sick fund" in case of emergency or pregnancy; (3) unless there is proved good health apart from diabetes; (4) unless the two contracting parties have known each other long enough to realize what the treatment of diabetes by diet and insulin involves; (5) unless the two have such strength of character that they will sustain the shocks of life with a smile; (6) unless the diabetic is sensible and follows the general rules of treatment.

The children of diabetic parents are apt to be large and precocious. With avoidance of obesity it will be exceedingly rare for one of them to develop diabetes. As yet no one of my diabetic patients who has married since coming for treat-

ment has later given birth to a diabetic child, but, of course, as yet the number who have married is small.

Parturition involves some anxiety. The child is very likely the first child and a large one at that. Sudden alterations in the insulin requirements of the mother often follow delivery and the infant too must be watched, because its pancreas may have been unusually active, prior to birth, and if this continues, even for a few hours after birth, without nourishment from the mother or other food, a low blood sugar, hypoglycemia, could take place.

I cannot advise two diabetics to marry one another.

FIG. 40.—Case No. 3030. Age at onset twenty-four years, eight months, duration six years, one month. First little boy, now three and a half years of age but wearing seven-year clothes, was born on December 19, 1924. The second baby is three weeks of age and was born in June, 1928. Present diet of the mother is carbohydrate, 110 grams; protein, 65 grams; fat, 136 grams. Insulin 15–0–15 units.

CHAPTER XVIII.

EXPECTATION OF LIFE. PROGNOSIS.

Everybody has what is called by insurance parlance an expectation of life when he is born. Two generations ago this was thirty-eight years, but now it is as much as fifty-eight years in the United States of America. As the individual grows older his expectation changes, and from the accompanying Table 24 one can determine the expection of life of the average individual for any given age from fifteen years onward. Diabetic patients can study this table with advantage. With their increased knowledge of diet, with the especial attention they devote to exercise, sleep, cleanliness, and because of the frequent health examinations they undergo at the hands of their physicians, they have an excellent opportunity to outlive their estimated expectation of life and thus prove themselves the masters of their disease.

How long can a diabetic live? That depends largely on his common sense. He can live indefinitely, but will he do so? The question cannot be answered for many many years, because the discovery and use of insulin did not begin until 1922 and was not generally employed until 1924. The course of the disease in children helps us most to answer the question, because before the introduction of insulin the duration of life of the diabetic child was 2.4 years, whereas in the six years since insulin only 2 children per 100 have succumbed per year and in twenty-two months ending July 1, 1928, the mortality has been but 1 child per 100 diabetic children annually. Furthermore, about 2 out of 3 deaths in my series of diabetic children since the discovery of insulin I consider needless and avoidable.

One in 100 of the diabetics I had seen up to July 1, 1926, had lived twenty-five years or more. Not until 1947 will

FIG. 41.—How 10 fat and 10 lean men fare as they walk through life.

twenty-five years have elapsed since insulin began to be utilized by my patients and really not until then can one form a very accurate idea of its effect. The year 1947 is a long

TABLE 24.—EXPECTATION OF LIFE. AMERICAN-CANADIAN MORTALITY INVESTIGATION, 1900–1915.

American Men.

Age.	Expectation.	Age.	Expectation.	Age.	Expectation.
15	50.06	45	25.22	75	6.69
16	49.23	46	24.41	76	6.32
17	48.40	47	23.62	77	5.96
18	45.58	48	22.83	78	5.62
19	46.75	49	22.06	79	5.30
20	45.93	50	21.29	80	4.99
21	45.11	51	20.53	81	4.69
22	44.29	52	19.79	82	4.41
23	43.47	53	19.05	83	4.14
24	42.65	54	18.33	84	3.89
25	41.83	55	17.62	85	3.65
26	41.01	56	16.93	86	3.42
27	40.18	57	16.25	87	3.21
28	39.36	58	15.58	88	3.00
29	38.53	59	14.93	89	2.81
30	37.70	60	14.29	90	2.63
31	36.87	61	13.67	91	2.46
32	36.03	62	13.06	92	2.30
33	35.19	63	12.47	93	2.15
34	34.35	64	11.90	94	2.01
35	33.51	65	11.34	95	1.87
36	32.67	66	10.80	96	1.74
37	31.83	67	10.28	97	1.61
38	30.99	68	9.77	98	1.50
39	30.15	69	9.28	99	1.34
40	29.32	70	8.81	100	1.19
41	28.49	71	8.35	101	1.07
42	27.66	72	7.91	102	0.83
43	26.84	73	7.49	103	0.50
44	26.03	74	7.08		

way off, consequently I am made happy whenever I see any of my diabetics who have outlived their expectation of life at the onset of their disease and appear in good health and spirits.

CHAPTER XIX.

THE PREVENTION OF DIABETES.

There are entirely too many diabetic patients in the country. To avoid accessions to this group preventive measures must be employed. At present the increase in the incidence is most rapid in the changeable period of middle life. In my series the most frequent year of onset for women is fifty years, for men fifty-one years. Diabetes is somewhat more common in women and much more frequent in Jews. Consequently efforts for prevention should be concentrated upon women, and especially Jewish women. As today obesity is the most common etiological factor one must insist that these susceptible individuals do not get fat, particularly if there is also present an hereditary tendency to diabetes.

If one regards diabetes as a penalty of obesity, the greater the obesity the more likely is Nature to enforce it. A fat man generally has a fat wife, so it is not uncommon to encounter the disease in both heads of the family. Fat parents have fat children, so it is no wonder that diabetes is hereditary in 25 per cent of the cases. Obesity is so common in the Hebrew race that it is easy to understand why diabetes is two and a half times as frequent in the Jewish population of Boston as in the rest of the community.

Lack of exercise is, of course, a factor in producing the condition of overweight and thus is an indirect cause of diabetes. Disuse of the muscles, however, is also a direct factor, for it is largely in the muscles that the sugar formed from the food is consumed. The man who gives up an active outdoor life and is promoted to an office chair by this change becomes a promising candidate for diabetes.

No other condition rivals obesity in importance as a forerunner of diabetes, but a strenuous, mental life is probably of some significance. This appears reasonable for it has been

shown that medical students, after three-hour written examinations upon which their promotion for a year depends, often show sugar in the urine temporarily, and it may not be a chance coincidence that numerous children have been under my care for diabetes who had recently led their respective classes at school. An illustration of this tendency is Case No. 1380, a child who came to my office showing 6.2 per cent of sugar. She had skipped two classes at school, and the following summer had eaten even more than her habitually large amount of sweets and candy.

In the presence of an infectious disease, for example tonsillitis, an existing diabetes grows worse; but it is yet to be demonstrated that diabetes frequently occurs as the result of an infection, save in the region of the pancreas and gall-bladder. A history of gall stones not infrequently precedes that of diabetes, which with such an origin is often benign.

Hereditary cases are usually mild. With the avoidance of obesity and with moderation in the use of sweet food the children of diabetics may be no more liable to the disease than other children. Particularly should the urines of such individuals be carefully examined when conditions arise which would favor the development of diabetes.

Patients with an hereditary tendency to diabetes should be instructed (1) to control, by their body weight, the total quantity of food eaten; and (2) to take carbohydrate almost exclusively in the form of starch rather than sugar, and never to indulge in unusual quantities of carbohydrate, such as candy, maple sugar, or sweet fruits; and (3) not to make the great mistake of considering the diet alone of importance. Mental relaxation and physical exercise should be promoted. If we are to bring about a decrease of diabetes in the community it will be with measures such as these. Every agency which promotes health and physical development tends to prevent an outbreak of the diabetic tendency. "It is easier to keep well than to get well." (Greeley.)

It would be most unfortunate for two individuals each hereditarily burdened with diabetes to wed, though by care in environmental conditions the consequences of heredity might be averted and the tendency decrease in the third generation.[1]

[1] Pribram: Ztschr. f. klin. Med., 1914, **81**, 120.

Pregnancy.—During pregnancy sugar is apt to occur in the urine. Mild cases of glycosuria which go untreated in pregnancy may later in the same or in subsequent pregnancies become aggravated cases of diabetes.

Gall Stones.—Gall stones are about 50 per cent more common among diabetics over twenty-five years of age than among a similar group in the community at large. As gall stones are proverbially more frequent among women, it is of especial interest that females are now showing a higher incidence of diabetes than men. Gall stones often precede diabetes and may precipitate it by direct extension of infection to the head of the pancreas. This seems likely, because there the islands of Langerhans are few and the gall stone type of diabetes is mild.

My advice to non-diabetic patients with gall stones is to be operated upon not only because of the danger of repeated attacks of gall stones and of the danger of a subsequent cancer, but also because of the danger of the development of diabetes. To diabetic patients my advice is to have the gall stones removed when the conditions of time, place, surgeon, and physician are all propitious. Surgeons who operate for gall stones in a non-diabetic may prevent diabetes, although unaware of the good they have done.

Overweight predisposes to diabetes and I certainly know it. For the prevention of more than one-half of the cases of diabetes in this country no radical undernutrition is necessary; the individual is simply asked to maintain the weight of his average fellow man. It is desirable to spread the information that those live longest who above the age of thirty-five years are 5 to 10 per cent below the average normal weight. Patients should be cautioned against gaining weight particularly after infectious diseases, pregnancy, after operations for gall stones, and when changing from an active to a sedentary mode of life. Although emphasis is usually laid upon the appearance of sugar in the urine with a patient losing weight, it cannot be too strongly emphasized that it is a common occurrence for sugar to appear in the urine when a patient is gaining weight. The first hint of diabetes occurred in Case No. 1207 when she weighed 142 pounds in

1895, but the disease did not become established in full force until 1912, when her weight was 248 pounds:

The slow onset of diabetes is favorable for prevention. There is good reason to believe that the outbreak can be postponed or even prevented. In children diabetes comes on more rapidly, but among children this halting onset is occasionally seen and a considerable interval occurs before the disease becomes permanent. Case No. 129 showed sugar in the urine in 1901, at the age of three years "at a time when she appeared out of condition. Examining her frequently after that I failed to find it and did not look for it again until in February, 1905, when she appeared like a full-fledged case of diabetes."

Case No. 1008 showed sugar in the urine on repeated occasions at the age of forty years, was carefully treated for sixty days and later no sugar was found, but it reappeared when the patient was aged fifty-one years, and he came under my observation three years later, with severe diabetes.

Who would say that the onset of diabetes in George M., Case No. 2151, aged twenty years, could not have been prevented? His grandfather and father had diabetes. His weight was 29 per cent above standard for his age, and he reports eating two whole pies a day and a whole bottle of cream on his pudding on Sunday. Now he has cataract though the diabetes is mild.

FIG. 42. Has a young woman 5 feet 3 inches tall any excuse to weigh 190 pounds when she has so agreeable a companion as "Bill'o" to take her for a stroll twice a day? A dog goes to walk at least twice a day. Do you treat yourself as well as you do your dog?

CHAPTER XX.

WEIGHT PECULIARITIES.

Most diabetic patients are obese prior to the onset of diabetes. However, as soon as sugar begins to be lost in the urine, the weight usually falls because the body is unable to utilize the food eaten even though the quantity be excessive. It is not uncommon for a patient to lose 50 pounds before diabetes is discovered and treatment begins, and occasionally a patient will lose as much as 100 pounds during the course of years. A diabetic patient, whose urine is free from sugar, in reality is probably in safer condition if he is 10 to 20 per cent below weight, because thus he can be assured that he is not overeating. In this respect it is better to emulate the Indian and Uncle Sam than the Eskimo and John Bull. The individual 10 per cent and even 20 per cent below weight may not be a delight to our eyes, but if over thirty-five years of age and in this condition, he is much more acceptable to the insurance company. It is often desirable for a patient to lose weight, but this should be undertaken only under the doctor's direction. Frequently it is only by losing weight that a patient regains the power to tolerate carbohydrate. As a guide to the proper weight for a diabetic the average weights of individuals for given heights and weights when dressed are given in Tables 25 to 29.

Gain in weight in the course of diabetes is encouraging, but the weight gained should be moderate and not quite sufficient to bring the weight of the patient up to normal standard. Even with insulin one sees the harmful effect of a marked gain in weight, because it is more difficult to keep the urine sugar-free. It is a good rule to keep the weight a little below normal, unless you are under thirty-five years of age; in the latter event it is safer to be above normal

weight. The fad among girls for being underweight apparently has increased their tendency to develop tuberculosis.

TABLE 25.—HEIGHTS AND WEIGHTS OF CHILDREN BETWEEN ONE AND FOUR YEARS OF AGE (WITHOUT CLOTHES).[1]

5602 boys		Age, months.	4821 girls	
Height, inches.	Weight, pounds.		Height, inches.	Weight, pounds.
26.5	18.0	6	25.9	16.8
27.3	19.1	7	26.5	17.4
27.6	19.8	8	27.0	18.3
28.1	20.4	9	27.6	19.1
28.5	20.9	10	27.9	19.5
29.0	21.4	11	28.4	20.1
29.4	21.9	12	28.9	20.8
29.9	22.9	13	29.4	21.0
30.3	23.0	14	29.5	21.6
30.8	23.6	15	30.1	21.9
31.1	24.1	16	30.5	22.6
31.4	24.5	17	30.8	22.9
31.8	24.6	18	31.1	23.4
32.3	25.5	19	31.5	23.8
32.6	25.8	20	32.0	24.1
32.9	25.8	21	32.3	24.8
33.3	26.9	22	32.6	25.3
33.6	27.0	23	32.9	25.6
33.8	27.1	24	33.4	26.4
34.0	27.9	25	33.8	26.9
34.1	28.3	26	33.9	27.3
34.8	29.0	27	33.9	27.3
35.1	29.1	28	34.6	27.8
35.4	29.3	29	34.8	27.8
35.4	29.5	30	34.9	28.3
35.5	30.5	31	35.1	28.8
36.0	30.6	32	35.4	29.0
36.1	30.6	33	35.6	29.1
36.5	31.1	34	36.5	30.1
36.8	31.9	35	36.5	30.3
37.1	32.3	36	36.8	30.5
37.4	32.3	37	36.8	30.8
37.5	32.4	38	37.0	31.0
37.9	33.1	39	37.3	31.6
38.5	33.5	40	37.5	32.0
38.6	33.6	41	37.8	32.3
38.6	33.8	42	38.0	32.5
38.8	33.8	43	38.3	32.8
38.9	34.3	44	38.5	33.0
39.0	34.5	45	38.5	33.5
39.0	34.8	46	38.8	33.5
39.3	35.8	47	38.9	33.5
39.5	35.9	48	39.0	33.8

[1] Crum, F. S.: Quarterly Publication of the American Statistical Association, Boston, September, 1916, N. S., No. 115, **15**, 332.

TABLE 26.—HEIGHTS AND WEIGHTS OF BOYS BETWEEN FIVE TO FOURTEEN YEARS (WITHOUT CLOTHES).[1]

BOYS

| | Weight in Pounds | | |

TABLE 28.—HEIGHTS AND WEIGHTS OF 221,819 MEN OF FIFTEEN OR MORE YEARS OF AGE (WITH CLOTHES).[1]

Age.	Graded average weight in pounds with clothes.																	
	Feet and inches with shoes.																	
	5–0	5–1	5–2	5–3	5–4	5–5	5–6	5–7	5–8	5–9	5–10	5–11	6–0	6–1	6–2	6–3	6–4	6–5
15	107	109	112	115	118	122	126	130	134	138	142	147	152	157	162	167	172	177
16	109	111	114	117	120	124	128	132	136	140	144	149	154	159	164	169	174	179
17	111	113	116	119	122	126	130	134	138	142	146	151	156	161	166	171	176	181
18	113	115	118	121	124	128	132	136	140	144	148	153	158	163	168	173	178	183
19	115	117	120	123	126	130	134	138	142	146	150	155	160	165	170	175	180	185
20	117	119	122	125	128	132	136	140	144	148	152	156	161	166	171	176	181	186
21	118	120	123	126	130	134	138	141	145	149	153	157	162	167	172	177	182	187
22	119	121	124	127	131	135	139	142	146	150	154	158	163	168	173	178	183	188
23	120	122	125	128	132	136	140	143	147	151	155	159	164	169	175	180	185	190
24	121	123	126	129	133	137	141	144	148	152	156	160	165	171	177	182	187	192
25	122	124	126	129	133	137	141	145	149	153	157	162	167	173	179	184	189	194
26	123	125	127	130	134	138	142	146	150	154	158	163	168	174	180	186	191	196
27	124	126	128	131	134	138	142	146	150	154	158	163	169	175	181	187	192	197
28	125	127	129	132	135	139	143	147	151	155	159	164	170	176	182	188	193	198
29	126	128	130	133	136	140	144	148	152	156	160	165	171	177	183	189	194	199
30	126	128	130	133	136	140	144	148	152	156	161	166	172	178	184	190	196	201
31	127	129	131	134	137	141	145	149	153	157	162	167	173	179	185	191	197	202
32	127	129	131	134	137	141	145	149	154	158	163	168	174	180	186	192	198	203
33	127	129	131	134	137	141	145	149	154	159	164	169	175	181	187	193	199	204
34	128	130	132	135	138	142	146	150	155	160	165	170	176	182	188	194	200	206
35	128	130	132	135	138	142	146	150	155	160	165	170	176	182	189	195	201	207
36	129	131	133	136	139	143	147	151	156	161	166	171	177	183	190	196	202	208
37	129	131	133	136	140	144	148	152	157	162	167	172	178	184	191	197	203	209
38	130	132	134	137	140	144	148	152	157	162	167	173	179	185	192	198	104	210
39	130	132	134	137	140	144	148	152	157	162	167	173	179	185	192	199	205	211
40	131	133	135	138	141	145	149	153	158	163	168	174	180	186	193	200	206	212
41	131	133	135	138	141	145	149	153	158	163	168	174	180	186	193	200	207	213
42	132	134	136	139	142	146	150	154	159	164	169	175	181	187	194	201	208	214
43	132	134	136	139	142	146	150	154	159	164	169	175	181	187	194	201	208	214
44	133	135	137	140	143	147	151	155	160	165	170	176	182	188	195	202	209	215
45	133	135	137	140	143	147	151	155	160	165	170	176	182	188	195	202	209	215
46	134	136	138	141	144	148	152	156	161	166	171	177	183	189	196	203	210	216
47	134	136	138	141	144	148	152	156	161	166	171	177	183	190	197	204	211	217
48	134	136	138	141	144	148	152	156	161	166	171	177	183	190	197	204	211	217
49	134	136	138	141	144	148	152	156	161	166	171	177	183	190	197	204	211	217
50	134	136	138	141	144	148	152	156	161	166	171	177	183	190	197	204	211	217
51	135	137	139	142	145	149	153	157	162	167	172	178	184	191	198	205	212	218
52	135	137	139	142	145	149	153	157	162	167	172	178	184	191	198	205	212	218
53	135	137	139	142	145	149	153	157	162	167	172	178	184	191	198	205	212	218
54	135	137	139	142	145	149	153	158	163	168	173	178	184	191	198	205	212	219
55	135	137	139	142	145	149	153	158	163	168	173	178	184	191	198	205	212	219

[1] Association of Life Insurance Directors and Actuarial Society of America, New York, 1912, p. 38. Published by a committee. Allow 1 inch for shoes and 10 pounds for clothes.

TABLE 29.—HEIGHTS AND WEIGHTS OF 136,504 WOMEN OF FIFTEEN OR MORE YEARS OF AGE (WITH CLOTHES).[1]

Age.	Graded average weight in pounds with clothes.																
	Feet and inches with shoes.																
	4–8	4–9	4–10	4–11	5–0	5–1	5–2	5–3	5–4	5–5	5–6	5–7	5–8	5–9	5–10	5–11	6–0
15	101	103	105	106	107	109	112	115	118	122	126	130	134	138	142	147	152
16	102	104	106	108	109	111	114	117	120	124	128	132	136	139	143	148	153
17	103	105	107	109	111	113	116	119	122	125	129	133	137	140	144	149	154
18	104	106	108	110	112	114	117	120	123	126	130	134	138	141	145	150	155
19	105	107	109	111	113	115	118	121	124	127	131	135	139	142	146	151	155
20	106	108	110	112	114	116	119	122	125	128	132	136	140	143	147	151	156
21	107	109	111	113	115	117	120	123	126	129	133	137	141	144	148	152	156
22	107	109	111	113	115	117	120	123	126	129	133	137	141	145	149	153	157
23	108	110	112	114	116	118	121	124	127	130	134	138	142	146	150	153	157
24	109	111	113	115	117	119	121	124	127	130	134	138	142	146	150	154	158
25	109	111	113	115	117	119	121	124	128	131	135	139	143	147	151	154	158
26	110	112	114	116	118	120	122	125	128	131	135	139	143	147	151	155	159
27	110	112	114	116	118	120	122	125	129	132	136	140	144	148	152	155	159
28	111	113	115	117	119	121	123	126	130	133	137	141	145	149	153	156	160
29	111	113	115	117	119	121	123	126	130	133	137	141	145	149	153	156	160
30	112	114	116	118	120	122	124	127	131	134	138	142	146	150	154	157	161
31	113	115	117	119	121	123	125	128	132	135	139	143	147	151	154	157	161
32	113	115	117	119	121	123	125	128	132	136	140	144	148	152	155	158	162
33	114	116	118	120	122	124	126	129	133	137	141	145	149	153	156	159	162
34	115	117	119	121	123	125	127	130	134	138	142	146	150	154	157	160	163
35	115	117	119	121	123	125	127	130	134	138	142	146	150	154	157	160	163
36	116	118	120	122	124	126	128	131	135	139	143	147	151	155	158	161	164
37	116	118	120	122	124	126	129	132	136	140	144	148	152	156	159	162	165
38	117	119	121	123	125	127	130	133	137	141	145	149	153	157	160	163	166
39	118	120	122	124	126	128	131	134	138	142	146	150	154	158	161	164	167
40	119	121	123	125	127	129	132	135	138	142	146	150	154	158	161	164	167
41	120	122	124	126	128	130	133	136	139	143	147	151	155	159	162	165	168
42	120	122	124	126	128	130	133	136	139	143	147	151	155	159	162	166	169
43	121	123	125	127	129	131	134	137	140	144	148	152	156	160	163	167	170
44	122	124	126	128	130	132	135	138	141	145	149	153	157	161	164	168	171
45	122	124	126	128	130	132	135	138	141	145	149	153	157	161	164	168	171
46	123	125	127	129	131	133	136	139	142	146	150	154	158	162	165	169	172
47	123	125	127	129	131	133	136	139	142	146	151	155	159	163	166	170	173
48	124	126	128	130	132	134	137	140	143	147	152	156	160	164	167	171	174
49	124	126	128	130	132	134	137	140	143	147	152	156	161	165	168	172	175
50	125	127	129	131	133	135	138	141	144	148	152	156	161	165	169	173	176
51	125	127	129	131	133	135	138	141	144	148	152	157	162	166	170	174	177
52	125	127	129	131	133	135	138	141	144	148	152	157	162	166	170	174	177
53	125	127	129	131	133	135	138	141	144	148	152	157	162	166	170	174	177
54	125	127	129	131	133	135	138	141	144	148	153	158	163	167	171	174	177
55	125	127	129	131	133	135	138	141	144	148	153	158	163	167	171	174	177

[1] Association Life Insurance Directors and Actuarial Society of America, New York, 1912, p. 67. Published by a committee. Allow $1\frac{1}{2}$ inches for shoes and 6 pounds for clothes.

Changes in Weight During Treatment.—Diabetic patients are often surprised at the sudden change in weight when they undergo a short course of treatment. Occasionally the weight goes up, but more often it falls. It may remain the same or even increase during marked restriction of the diet. The reason for these queer changes is to be explained by the retention or discharge of water from the tissues. The following experiment conducted by me many years ago illustrates this well: A student was given a diet sufficient to maintain his body weight so far as nutritive value was concerned, but from his food salt was entirely removed. As a result, in the course of thirteen days the weight fell 11.66 pounds. Upon the resumption of his former diet with salt as desired, 9 pounds of those lost were regained in three days. Diabetic patients often gain weight from exactly the same cause—namely, the ingestion of too much salt. Such gain in weight, however, should be looked upon at its face value, in other words simply as a retention of fluid in the body.

Case No. 1378, showing considerable dropsy, lost weight as shown in Table 30. When the equivalent of the weight lost was weighed out in water it half-filled a pail, and when we realized that this had been carried about all day in the tissues of the patient, all of us were far more sympathetic toward the patient's disinclination to go up and down stairs.

TABLE 30. CHART OF CASE NO 1378. ILLUSTRATION OF DISAPPEARANCE OF DROPSY CO-EXISTENT WITH LOSS OF WEIGHT DUE TO A SALT-FREE DIET.

Date, 1917.	Urine.			Diet in grams.					Weight, pounds.
	Diacetic acid	NaCl, gm.	Sugar, total gm.	Carbohydrate.	Protein.	Fat.	Alcohol.	Calories.	
Sept. 13–14	0	—	0	3	20	6	..	146	89¼
23–24	0	4.9	6	17	50	42	50	996	98¾
Oct. 21–22	0	..	0	12	53	52	30	938	69½

Soon after entrance of this patient to the hospital the salt in the diet was partially restricted, but evidently not enough to prevent increase in weight, as Table 30 shows September

23–24). From this point onward the salt was excluded with the greatest care from the diet, and the weight fell uniformly. It is noteworthy that this patient a year previously, some thousands of miles from Boston, had been given during a period of six months enemata of 8 quarts of salt and soda daily. Furthermore, she was then in the habit of taking beef tea loaded with salt, and each week consumed 1½ pounds of salted almonds, as well as using salt freely in her food.

A man or woman shudders at the thought of carrying about a pailful of dropsy, but how many ladies and gentlemen transport with composure several pailfuls of fat! They are not water-logged, but fat-logged. Few of them are willing to face those elemental truths that no farmer has yet found a way to fatten hogs except with excess of food and little exercise. I fear I am a little hard-hearted toward my obese friends. A New England conscience compels the disclosure that my grandfather weighed 300 pounds, did not have diabetes, and death came from that old man's friend, pneumonia, upon his eightieth birthday. He was the exceptional man and to him I attribute the optimism which is so helpful in medicine.

Removal of the carbohydrate in an individual's diet, though it is replaced by an equivalent number of calories in the form of fat, causes a prompt fall in weight, and if the reverse procedure is adopted, the weight will rise. The loss or gain of weight which occurs under such conditions may amount to 2 pounds in a day for several days. It is explained by the varying quantities of water which are retained in the body according to whether carbohydrate or fat is stored.

Finally, there is a real reason for a loss of weight during the treatment of diabetes, due to the fact that at times the diet is deficient in calories. Under these circumstances the patient lives upon his own tissues. Calculations show that under such circumstances from every pound lost approximately 1500 Calories are derived. To gain or lose 1 pound of actual tissue, therefore, approximately 1500 Calories excess or deficit are required in the daily menu.

The foregoing height and weight tables (Tables 25 to 29, inclusive) were selected by Dr. Horace Gray as the most satisfactory in the literature.

CHAPTER XXI.

COST OF A DIABETIC DIET.

The diet of the diabetic patient with its fresh vegetables, fruit, and cream is somewhat expensive, but it costs far less if he is treated than if he is untreated. In the latter state the waste of food in the form of sugar in the urine is enormous.

Case No. 1171, told me that before treatment was begun, he ate 13 eggs for breakfast, not by any means as a stunt, but because he wanted them.

Table 31.—Estimated Diet of a Woman of Thirty-five Years, Case No. 1147, Prior to Treatment. Weight, Seventy-two Kilograms (158 Pounds).

Food for twenty-four hours.	Quantity.	Carbohydrate, gm.	Protein, gm.	Fat, gm.
Eggs	12	0	72	72
5 per cent vegetables	450 gm.	15	8	0
Milk	2000 cc.	96	64	64
40 per cent cream	240 "	8	8	96
Butter	90 gm.	0	0	75
Meat	120 "	0	32	20
Bread	100 "	60	10	0
Totals	...	179	194	327
		4	4	9
Total Calories.	...	716	776	2943

Total Calories 4435 ÷ 72 kilograms = approximately 60 Calories per kilogram body weight.

Case No. 1147, a lady, aged thirty-five years, ate a dozen eggs a day, and in response to my request gave me a report of her daily diet before she began treatment. This is shown in Table 31. It will be observed, however, that the carbohydrate was below normal—good evidence, therefore, that her diet had already been somewhat altered from the normal

before the time at which she reported; undoubtedly her diet before treatment was begun was considerably in excess of that recorded. Her duration of diabetes was 5.5 years; she died in September, 1919, of diabetic coma.

Although the diet contained 60 Calories per kilogram body weight instead of the normal 30 Calories, the patient, while upon it, lost 66 pounds in a little over two and a half years. The reason for this was apparent, for on October 6, 1916, the volume of the urine was estimated at 6000 cc. (6 quarts) and the sugar was found to be 5 per cent, or 300 grams (10 ounces), the equivalent of a loss of 1200 Calories in the urine in twenty-four hours, or as we have seen on page 155 to four-fifths of 1 pound of body weight. In one year this would amount to 240 pounds of sugar! After a two weeks' stay in the hospital she felt more content with a diet of 1600 Calories —a trifle less than her body needed—than when upon the 4400 Calories at entrance.

It is obvious that the saving of food which results from becoming sugar-free under modern treatment must be considerable. It is the diet of the untreated diabetic which is expensive, since the large excess is far worse than wasted.

Case No. 295 voided in twenty-four hours, on October 23–24, 1909, approximately 10 liters of urine (nearly 20 pounds), containing 680 grams of sugar, the equivalent of 2720 Calories. His urine for a day weighed one-fifth of his body. The weight of this patient was 50 kilograms, 110 pounds. In other words, he lost in the urine 54 Calories per kilogram, an amount sufficient in calories to supply almost double his own needs if taken in the form of food which he could assimilate.

Diabetic patients with acid poisoning lose calories in the urine in the form of sugar and of acid bodies as well. The quantity of acid bodies thus lost is quite considerable. These acid bodies represent wasted food just as much as does the sugar in the urine. Case No. 344 is a good illustration of this. On December 25–26, 1911, he excreted 188 grams sugar, the equivalent of (188 $\times$ 4) 752 Calories, and in addition 55 grams acid bodies, equivalent to (55 $\times$ 5) 275 Calories. Acid intoxication is really a dreadful robber,

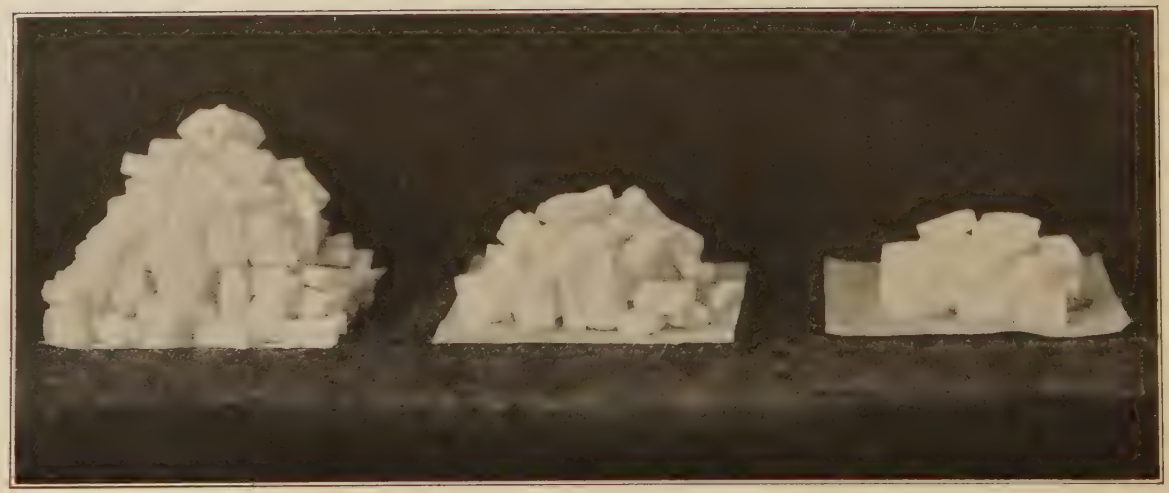


FIG. 43.—SUGAR MEASURED AS LUMP SUGAR, LOST IN THE URINE BY UNTREATED DIABETIC PATIENTS.

Case No. 295	Case No. 1147	Case No. 653
A Severe Diabetic	A Moderate Diabetic	A Mild Diabetic
680 grams a day	300 grams a day	174 grams a day
546 pounds (1½ barrels) a year	240 pounds (⅔ barrel) a year	140 pounds (⅖ barrel) a year

for besides stealing the food of a patient, it frequently steals his life! Against it the diabetic can insure himself by not overeating, particularly by not overeating of protein and fat, and by keeping the urine sugar-free with insulin.

The diet of the treated diabetic is also expensive. In comparing the diet of the diabetic patients with those of the non-diabetic patients at the New England Deaconess Hospital in the pre-insulin period Miss Dike and Miss Wallace found that the diabetic diet was 26 per cent more expensive, but it is less so today because the diabetic can take more carbohydrate, and sugar and starch are the cheapest kinds of foods. The diabetic patient cannot subsist on cheap carbohydrate foods, such as cereals, bread and potatoes, but must replace these with expensive foods such as eggs, meat, fruit and fresh vegetables.

The diabetic can save expense if discretion is employed. Tea and cocoa shells are cheaper than coffee and cracked cocoa. Oleomargarine or other preparations may be substituted for butter and employed instead of bacon and cream. Vegetables, whether fresh or canned can be purchased in bulk. Broth is expensive and a luxury. The home canning of vegetables in diabetic families should be encouraged. A garden is a great advantage.

Lettuce may be the best vegetable for a diabetic, but cabbage is the cheapest. Patients seldom tire of cabbage any more than normal individuals tire of potato. Perhaps this is because it can be served in so many different forms. Fats are costly as compared with carbohydrate foods, but there is great variation in the cost of fat. One of my patients made the following computations.

	Calories
One cent in 20 per cent cream yields	26
One cent in butter yields	52
One cent in oil	110

CHAPTER XXII.

AN INSULIN SYRINGE.

An insulin syringe usually is graduated to hold 1 cubic centimeter (1 cc.) or about 15 drops of water. Some syringes contain 1.5 cubic centimeters and still others 2 cubic centimeters. Each syringe should be inspected to determine its capacity.

All syringes show the cubic centimeter divided into 10 major divisions.

One of these major divisions is occasionally subdivided into minor divisions, just as an inch may be divided into quarter inches and each quarter inch into four-sixteenths of an inch.

Insulin comes in different strengths. Some bottles contain 10 units for each cubic centimeter and this insulin is called U-10 insulin, others contain 20 units per cubic centimeter, called U-20 insulin, still others 40, called U-40 insulin and occasionally one sees so concentrated a solution of insulin as 80 units per cubic centimeter, called U-80 insulin. Therefore, if a patient gives himself a full cubic centimeter of insulin he will receive 10, 20, 40 or 80 units according to the strength of the insulin in the bottle. Always read the label on the bottle and note the strength of the insulin it contains.

One division of the ten divisions upon the one cubic centimeter syringe would contain 1 unit if the syringe was filled with U-10 insulin, 2 units of U-20, 4 units of U-40 and 8 units of U-80. It is thus easy to calculate the dose no matter the kind of insulin available. Of course the more concentrated the insulin, *i. e.*, the more units in 1 cubic centimeter, the less fluid there is to inject. To get 20 units would take 2 entire cubic centimeters (2 syringes) of U-10, 1 cubic centimeter of U-20 but only one-half cubic centimeter of U-40.

Some syringes contain 1 cubic centimeter, but instead of

being subdivided and designated as tenths of a cubic centimeter are marked for the convenience of the patient in units. Upon one side of the scale the units are given for the use of U-20 insulin: upon the other side of the scale for the stronger

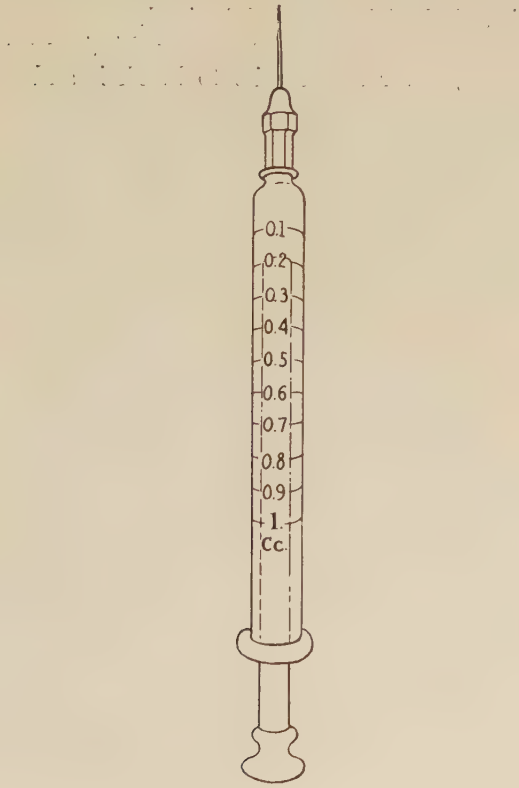


FIG. 44

U-40 insulin. This avoids the necessity of calculations, but the patient must be careful and read the strength of the insulin printed upon the label on his bottle and then use the corresponding scale of the syringe. As a matter of fact the syringes are always divided into 10 parts.

CHAPTER XXIIII.

DOGS, DIABETICS AND THEIR FRIENDS.

A DOG is a diabetic's thoughtful friend.

A dog never says to a diabetic "You are thin," never speaks about his diet, never tempts him to break it and to eat a

FIG. 45.—Case No. 2007. A diabetic child and his dog, Bob, in 1923.

little more, never refers to the delicacies he himself has eaten or the good bones he expects to eat, in fact never implies by any sign or action in public or in private that he knows his master has diabetes. A diabetic is never embarrassed by his dog. How often he wishes his friends were as considerate!

A dog is a diabetic's teacher. His dog shows the diabetic how to rest and sleep at odd moments, shows him how to exercise and play, indicates the value of sunshine, and sets him a good example by cleaning his paws every night. A dog is cheerful. The friends of a diabetic sometimes wish that he would take lessons from his dog.

From experiments on a dog Minkowski found out that diabetes originated in the pancreas. From experiments on a dog Allen learned that undereating helped and overeating harmed diabetics. From experiments on a dog Banting and Best discovered insulin.

When I see this little boy, George, and his dog, Bob, and their devotion to one another, I am reminded of the million diabetics and future diabetics in the United States who may not be holding a dog in their arms, yet are alive today or will be alive, enjoying better health and happiness, all because a few dogs through the instrumentality of multitudes of scientific workers have revolutionized the treatment of diabetes.

Would you want to be a member of a society if it had for its object the prevention of a dog saving the life of a child? Do you think this dog, Bob, would want to join such a society?

FIG. 46.—Case No. 2007. Age at onset five years nine months, duration to December, 1928, eight years. George with his crew Bob have won many races. George is one of the diabetic children who is sailing uncharted seas to discover how older diabetics and other children can live. (Photograph taken in 1926.) Recent diet, 1929, carbohydrate, 141; protein, 79; fat, 94. Insulin 36–18–18–4.

CHAPTER XXIV.

DIABETIC CHILDREN.

The diabetic child at the onset of his disease is usually taller and heavier than the average child and is mentally precocious. The diabetic child, and perhaps the child of a diabetic, is a superior being and should be so regarded.

Intelligence is inborn in the diabetic child. At the age of ten years he acquires a knowledge of diabetes far more readily than the average diabetic of fifty years. It is true he lacks judgment and has not learned to reason, largely because he has not had the opportunity to study in the school of experience. He knows his Benedict test and is well aware of its significance. He understands the reckoning of his diet and recognizes errors in the same. He can administer his own insulin and occasionally prefers to do so. After a few experiences he detects the advent of an insulin shock almost intuitively. He appreciates what coma is, how it comes on, but is no more skilful in deciphering its stealthy approach than are nurses or most of us doctors.

Diabetic children are more sinned against than sinning and it is because of this that they do not get a fair show. They are underfed and overfed by a physician's fiat, often without rhyme or reason, because we do not take the time to study the individual case and unearth their real needs. Some of us even have fads and may try to see on how little protein, carbohydrate or calories they can maintain their spark of life. Insulin and the diet are so wonderful we are wont to dispense with our brains. We are generally more responsible than they for their shortcomings, and if a doctor is frank with himself, he will own it up.

Diabetic children mean to be honest. If they break a rule of diet, because they follow their instinct of self-preservation and sense of hunger, be careful what you say or do. If you say they steal food in their presence or before others, I protest and declare it is criminal before the bar of a child's soul,

if not before the bar of the law. Children will tell whether they have done right or wrong if kindly questioned. They will furnish the explanation of unexpected phenomena. Just as it is easier to be a total abstainer than a moderate drinker, so the old strict diet with starvation was easier to follow than the present liberal diets. Formerly diets were concrete, now they are intricate, and decision must be left to the discretion of the child to determine whether he should eat the sugar you make him carry in his pocket to protect himself from unconsciousness and convulsions.

Sometimes parents and doctors, too, place unnecessary temptation before a child. We have given up having the pigeons and the ducks fed with crackers and peanuts, but have substituted yellow field corn on the ear and a little bag of oats.

It is not so simple a matter to teach the diet today as in the Allen Era. Then a slight error in diet showed instantly in the Benedict test, but now it is less apt to be a true indicator of what has been eaten, because of insulin and the larger meals, since moderate additions to the diet are often tolerated. The child sees you constantly testing his tolerance by additions to his carbohydrate and it is natural for him to test it too.

Never ask a diabetic child if he has broken his diet any more than you would ask your best friend if he had been dishonest. Never accuse any one of breaking his diet. Instead proceed in the plainest and most logical manner to seek the truth. Express wonder and surprise about what has happened. Together with the child search for the reason. Build up the evidence point by point without disclosing your intent or suggesting that you realize its convincing force until the child has no desire to do else than account for the enigma. But do not force him to put this in words. Recall Hawthorne's Scarlet Letter and the agony of the guilty man who wanted to confess, but was prevented from confessing. Never fear, the poor little child is punished enough by his own conscience and far more than as if you blamed him. And when you are done with holding court, dismiss and forget the case.

A child lacks perspective so far as time is concerned. An

hour is a day, a day is a week, a month a year and a year is eternity. Hence be cautious and use great discretion in discussions before children. If questions about the future are asked, they must be promptly answered. Of course no one expects that diabetes will be treated ten years from now as it is today. There are a hundred working upon diabetic problems at present for a single one a generation ago and the chances of notable discoveries and improvements in treatment are infinitely better. I believe that something will be found which will make those lazy islands of Langerhans secrete good insulin. In the meantime every diabetic who lives for one more day comes so much nearer to the New Era with its cure of the disease.

Transgression of the diet is frequently the fault of the doctor and for one of two reasons. Either the doctor, and of course here I am referring to myself, has not explained clearly enough to Johnnie what he is after in recommending those strange and funny meals which his mother never gave him before, or a regimen of diet, exercise and insulin has been planned, which is incompatible with elementary principles of health.

Parents too are sometimes a problem and this is especially so when they take their children to the various categories of irregular practitioners. The children eventually always come back, but their spirit is always different, although they often seem thankful to live according to a rational regime again. To meet such contingencies safely security alone is found in the education of the child. He must be taught diabetes so thoroughly that he will reason, ask questions, expose inconsistencies and shams, and scorn ignorance.

The most important education for a diabetic child anyway is his diabetic education, because upon that his life depends. No matter how devoted the parents, no matter whether wealth allows a nurse, nothing will take the place of a child acquiring the fundamentals of his disease and how to combat it successfully. It was only by unusual coöperative effort between patient, family and doctor in pre-insulin days that a few diabetic children passed beyond the all too brief average lethal duration of two or three years and the coöperation is exactly as necessary today.

Indeed with the far longer and even indefinite length of life of the diabetic child it is all the more important and in the Diabetic Corporation which you parents form it is the child who should be Chairman of the Board. In the last event the responsibility for the care of any diabetic patient rests with himself. He is the only one who can possibly know all the reasons for the changes which take place in the urine. Recognizing this fact, one must be careful to gain his complete confidence for only in this way can the doctor help to remedy mishaps. If one intimidates or scolds the patient, the child will fear or be ashamed to tell the whole truth. More can be learned in the long run by frankness and the promise of aid to make future rules less difficult to keep.

The lives of diabetic children should resemble as nearly as possible the lives of other children. Very likely it is better to graduate from the high school at eighteen or nineteen instead of at seventeen years. This will allow more time for exercise, broad reading and maturity.

Diabetic children can eat essentially as can diabetic adults. The food must be eaten slowly and the child must be in a rested state both before and after meals. The few minutes between insulin and the meal can be advantageously employed resting. It is a mistake to pamper the appetites of children. Healthy children like plain foods and the same foods day after day. They love routine and habit. Mary's grandfather mischievously dropped a blueberry in the middle of the saucer of oatmeal Mary was contentedly eating and it spoiled her breakfast. It is a good plan for diabetic children or adults to make their breakfast a routine. In this way no calculations are necessary for at least one-third of the meals. Mary's great-grandfather used to leave a child alone when he saw he was happy and children loved his quiet ways.

To keep pace with the development of diabetic children is not an easy undertaking. Not only must one be keen to discern gains in tolerance for carbohydrate, but one must provide for the all-around development of body, mind and soul. At puberty, especially, these children are unstable and require extra quantities of food. To deprive them then of an adequate diet either leads to their taking it for them-

selves or what is almost worse, namely, retarded development. One must keep abreast of their mental growth as well and direct them along channels so that they can choose a suitable life's career.

The four period test is worth while with children. It gives the parents assurance. If sugar shows, less carbohydrate can be given or more insulin. Perhaps the three meals come too nearly together as so often is the case in the hospital, and if so they must break hospital routine by an early breakfast and a later supper, thus replacing most hospital meal hours of 8.00 A.M., 12.00 noon and 5.00 P.M. Perhaps the carbohydrate at breakfast should be lessened, or breakfast divided into two parts, the first at 7, 7.30 or 8.00 A.M. and the second at 10.00 A.M. It may be desirable to give a little insulin at 10.00 or 11.00 P.M. and the large dose of morning insulin a full hour before breakfast. Yesterday may have been rainy and sugar appears because of diminished exercise. Possibly the insulin has been given too long in one place, instead of using the same spot but once in a month.

Coma is the chief danger which overhangs the diabetic child. In the future it may be that accidents of hypoglycemia, due to environmental conditions, may claim increasing attention, but diabetic coma ever will be the one condition which the child should thoroughly understand and be in a position to avoid. Prior to insulin practically all diabetic children died of coma. Today not one of them needs to die of coma as you and I know well, because among 245 children during the year ending July 1, 1927, there were no such deaths.

Every child needs a "Buddy." His mother is his true friend when he is at home, but it is his Buddy who will look out for him at school and in play. Sam and Earl, my diabetic twins, are a great comfort to one another and guard well each other's interests.

Summer camps for diabetic children work well. For two years reports of the one I have known about have been most favorable and enthusiastic. These can be developed much more. With a carefully planned diet, freedom from temptation, congenial surroundings and well adjusted exercise the children did wonderfully well.

FIG. 47.—Was this diabetic girls' camp in 1928 the first in the country?

FIG. 48.—The three Bs—Betty, Barbara and Bobby at the diabetic girls' camp.

The diabetic child should be taught hygiene and while he learns this for himself he should grasp its potentialities so fully that he will disseminate sound ideas among the rest of his family, and thereby make himself helpful in the house. One in 3 of my diabetic children already has a diabetic relative. If a child holds to his diet, should not his relatives avoid being fat at forty or above and thus avoid diabetes? The time may come when we may utilize these children more in medicine. Every diabetic unavoidably becomes a center of medical influence in his family.

Children love to assume responsibility. Trust them and they will carry out their duties well. Jane and Jeane lived 1500 miles apart, but their poor mothers were worn out. When they were told this, their whole attitude changed and I had no more worry about those girls or about their mothers whom I knew they would compel to take recreation and rests. Give any child a chance and a diabetic child, who is almost invariably precocious, many chances and he or she will come out all right.

Every old man or old woman at the Deaconess who has a leg or a toe cut off for gangrene has a flag of the United States of America hung at the head of his bed for morâle. The morâle of the diabetic child quite as much as that of the adult must be preserved. I have no hesitation in showing children severe types of diabetes or even diabetic coma, but I would never think of doing this without at the same time calling attention to the possibility of improving our treatment, specifying and showing instances where this has been done and how the dread complications can be avoided. Happily it is not difficult to maintain their morâle, because these children excel in school and in many sports. They should be given opportunities to distinguish themselves. It is partly to help their morâle that I train them to stand straight, regard their personal appearance and act alert.

Thirty years ago when I began treating diabetic children I counted the days they lived. It is hard to believe, but it is true, that now I am beginning to measure their lives in decades of years.

TABLE 32.—FROM MONTHLY REPORT OF A CHILD, M. H. H., CASE NO. 2084, AFTER NINE YEARS OF DIABETES. AGE AT ONSET 3.2 YEARS IN JUNE, 1919.

Date.	Diet.				Insulin.		Urine, 4-period test.
	C.	P.	F.	Cal.	Insulin, units.	Time.	
14–15	110	85	90	1590	18	7:30	Y
					0	..	O
					6	5:30	G
					2	M.N.	O
15–16	110	85	90	1590	8	7:30	Y
					0	..	O
					8	5:30	G
					2	M.N.	O
16–17	110	85	90	1590	18	7:30	O
					0	..	O
					7	5:30	Y
					0	..	Y
17–18	110	85	90	1590	18	7:30	Y
					0	..	O
					8	5:30	O
					2	M.N.	O
18–19	110	85	90	1590	18	7:30	O
					0	..	O
					7	5:30	O
					2	M.N.	O
19–20	110	85	90	1590	18	7:30	O
					0	..	O
					7	5:30	O
					2	M.N.	O
21–22	110	85	90	1590	18	7:30	O
					0	..	O
					7	5:30	O
					2	M.N.	O
22–23	110	85	90	1590	18	7:30	O
					0	..	O
					7	5:30	G
					2	M.N.	O
23–24	110	85	90	1590	18	7:30	O
					0	..	O
					7	5:30	O
					2	M.N.	O
24–25	110	85	90	1590	18	7:30	O
					0	..	O
					7	5:30	O
					0	..	Y
25–26	110	85	90	1590	18	7:30	Y
					0	..	O
					7	5:30	G
					2	M.N.	O
26–27	110	85	90	1590	18	7:30	O
					0	..	O
					7	5:30	O
					2	M.N.	O
27–28	110	85	90	1590	18	7:30	G
					0	..	O
					7	5:30	O
					2	M.N.	O

CHAPTER XXV.

DIETETIC SUGGESTIONS, RECIPES AND MENUS.

The modern diabetic has little need for dietetic recipes, because the diabetic diet today is sufficiently varied and liberal to be both palatable and satisfying. Plain foods well cooked are enjoyed the most, and the taste for such grows rather than wanes. It is both less conspicuous and less troublesome to select the food from the diet of the rest of the family and with intelligence this can be done. The "Old Guard," the diabetics of ten years' duration, seldom care for frills. They like their four large portions of 5 per cent vegetables, 3 small oranges or equivalent in other fruit, a saucerful of oatmeal or slightly less of other cereal, 2 Uneeda biscuits or other crackers of similar weight, their ½ pint of cream of medium strength, 2 eggs, 4 strips of crisp bacon, 1 portion of meat of moderate size, and 3 portions of butter, the equivalent of carbohydrate 88 grams, protein 57 grams, fat 113 grams, Calories 1597. The less a diabetic alters the essentials of the standard diet the easier it is for him in the long run to adhere to it (see p. 173), knowing that in the course of time additions can be made to it. The diet here given is the one which is used most commonly at the Deaconess Hospital at the beginning of treatment of a diabetic patient.

This diet would suffice for an adult weighing 110 pounds, (50 kilograms), net. A boy or girl of similar weight would require more as would also a larger individual. For this purpose the meat, bacon, and butter could be doubled, thus increasing the protein to 78 grams and the fat to 163 grams or 534 Calories, a total of 2131 Calories. This would be sufficient for a man or woman at light work whose weight was 154 pounds (70 kilograms).

Familiarity with the substitutions for the articles of the Standard Diet puts a diabetic at ease.

TABLE. 33—STANDARD DIET.

Food.	Quantities.	Carbohydrate, gm.	Protein, gm.	Fat, gm.
3 to 5 per cent vegetables	4 portions or 600 grams or 20 ounces	20	10	10
Oranges	3 small or 300 grams or 10 ounces	30	0	0
Oatmeal (cooked)	1 saucerful or 30 grams (dry) or 1 ounce	20	5	2
Uneeda biscuit[1]; crackers	2	10	1	1
20 per cent cream	½ pint or 240 cc. or 8 ounces	8	8	48
Meat	1 portion or 60 grams or 2 ounces	0	16	10
Eggs	2	0	12	12
Bacon	4 crisp strips or 30 grams or 1 ounce	0	5	15
Butter	3 moderate portions or 30 grams or 1 ounce	0	0	25
		88	57	113
		4	4	9
		352	228	1017

Total Calories = 1597.

[1] A name for special crackers weighing about 6 grams each and containing 5 grams, approximately of carbohydrate.

A sailor excused himself for breaking his diet on the ground that 5 per cent vegetables were lacking on the voyage, but later agreed that cabbage, the best of all vegetables for the diabetic, had been always available. One of my severest

diabetics gained the most when he went to sea on a lumber schooner and lived on cabbage and fish. Generally there is at least one canned 5 per cent vegetable in the house.

If there is no fruit for the meal, one can substitute one portion of a 10 per cent vegetable or 2 Uneeda biscuits or a portion of potato the size of a small egg.

If medium cream is not at hand, remember that 1 Uneeda biscuit and 2 large portions (1 ounce, 30 grams) of butter are equal to ¼ pint of cream (4 ounces, 120 cubic centimeters). Instead of the ounce of butter one could take 2 tablespoonfuls of olive oil or select what would seem to be the equivalent of this quantity of fat on meat.

For the meat one can exchange fish or cheese and obviously all varieties of canned meat and fish are easily obtainable.

Substitutes for Breads.—Many of the preparations upon the market shown in Table 36, contain as great, or even a greater quantity of carbohydrates than ordinary bread; a few contain less; but the percentage of carbohydrate may vary from time to time. Patients, and sometimes physicians, forget that substitutes for bread must be prescribed only in definite amounts. A diabetic bread should never be advised without a knowledge of its content of carbohydrate, protein and fat. Just because various breads and other foods appear in the large tables, Tables 35 and 36, is no indication that they are recommended. Each must be judged by the analyses recorded.

The bread of one of the largest bakeries in Boston, upon analysis, showed 55 per cent carbohydrate. Bread made without milk or sugar, but with water and butter, contains 45 to 50 per cent carbohydrate. Such a bread is undoubtedly superior to many different bread substitutes upon the market. The percentage of carbohydrate in toast is greater than in plain bread, rye bread, or graham bread. Black bread and pumpernickel contain somewhat less carbohydrate. Never give bread substitutes early in treatment. Teach patients to live without them. Potatoes are safer than bread and a banana safer than a potato, though both contain equal percentages of carbohydrate, because the banana is limited in

size, usually containing about 20 grams carbohydrate, and the potato almost unlimited. The harmfulness of bread is its percentage (60 per cent or less) of carbohydrate which makes liability of an error in weight or in estimation of size fifteen times as great as with the 5 per cent vegetables. Another reason is its rapid absorption in contrast to the slow absorption of vegetables. Remember sugar runs into the blood, the carbohydrate of bread walks into the blood, but that of vegetables crawls into the blood. (See Fig. 31, page 96.) There are four types of bread substitutes:

(*a*) **Bran Bread.**—Bran is employed in the diet of diabetic patients but is usually bran washed nearly free of carbohydrate. This is neither more nor less than the use of cellulose, and this is supposed to have no effect upon the metabolism. Bread made of bran alone is not very palatable, though with the fat of bacon or butter it is liked better. It furnishes bulk and acts favorably upon constipation. It should be remembered that untreated bran contains about 56 per cent of carbohydrate of which approximately one-half is assimilable. For this reason and because of the molasses which they often contain, bran biscuits bought at a restaurant often prove to be a delusion and a snare. In purchasing bran to use for washed bran go to a feed store and ask for coarse bran for cattle and not for bran for the table, or secure packages of washed bran which are now on the market. The various preparations of bran, bran breads, and cookies sold under trade names often contain carbohydrate other than bran, hence the reason for their palatable taste; beware of them. They may contain over 60 per cent carbohydrate, of which less than 10 per cent is real bran. Mild diabetics get into little trouble with bran, but the serious ones often suffer.

To free bran from starch first sift in an ordinary flour-sifter. This eliminates a great deal of the finer starch, then tie the bran in cheesecloth and fasten the same on a faucet. It should be thoroughly mixed and kneaded from time to time to be sure the water reaches all portions and should be washed until the water comes away clear. This may require an hour.

Bran Wafers.

Washed bran	2 cups
India gum	1 tablespoonful
Mineral oil	1 tablespoonful

Salt and saccharine to taste. Ginger, cloves, anise or caraway seed, ½ teaspoonful, if desired.

Mix dry ingredients and then add bran and mineral oil with enough water to make a stiff dough. Knead with finger tips. Pat out and cut into thin cookies. Bake about forty-five minutes in a moderate oven until crisp.

Bran Cakes for Diabetics.

Food.	Amount.	Protein, gm.	Fat, gm.	Carbohydrate, gm.	Calories.
Bran	2 cups				
Melted butter	30 gm.	..	25	..	225
Eggs, whole	2	12	12	..	156
Egg-white, 1	25 gm.	3	..	..	12
Salt	1 teaspoonful				
		15	37	0	395

Mix the thoroughly washed and dry bran, well beaten whole eggs, butter and salt. Beat the egg-white very stiff and fold in at the last. Shape with knife and tablespoon into 3 dozen small cakes. If desired, ½ gram of cinnamon or other flavoring may be added. Each cake contains: protein, 0.5 gram; fat, 1 gram; Calories, 11. For analyses of preparations of bran, see pages 214, 232, 238.

(*b*) **Gluten Breads.**—These breads are made by removing the sugar-forming material from the flour. It is surprising how thoroughly this can be done. I have often found the percentage of carbohydrate in one such flour to be negligible. Unfortunately in certain so-called gluten breads the content of carbohydrate may be high. The large quantity of protein which all gluten breads contain is objectionable. Hence gluten bread should never be prescribed without a knowledge of its content of carbohydrate, protein, and fat.

(*c*) **Light Breads.**—French bread cut in thin slices is a possible substitute for bread, because it is bulky, gives the

appearance of a large quantity, and carries much butter. Manufacturers have taken advantage of this idea, and many light breads are on the market. These breads often contain about the same quantity of carbohydrate as ordinary bread, though a few contain considerably less. Their virtue consists solely in their bulk, which allows a surface on which to spread butter.

(*d*) **Various other substances** have been used for flour in the manufacture of bread. Thus, aleuronat meal, corn cob meal, casein under various trade names, and soy beans have been employed, and the manufacturers have been most ingenious in their preparation.

Soy bean is extensively used, and probably deserves a still wider introduction into the diabetic diet. The carbohydrate in it is unassimilable. Agar-agar may be used to dilute the flour or to add to bran and also to relieve the constipation of the diabetic, which is frequently troublesome. For the last few years India gum, suggested to me by Dr. Allen, has been substituted. It is much cheaper, and is as satisfactory. India gum will thicken broth or any fluid. In the right proportions it is the fundamental for a great many palatable recipes.

Substitutes for Milk.—A few tablespoonfuls of cream are a great comfort to a diabetic patient. The average patient usually receives 120 cc. to 240 cc. of 20 per cent cream daily. If it is desirable to give more fat without increasing carbohydrate and protein, 40 per cent cream may be substituted. Light cream contains about 12 per cent fat, medium cream about 20 to 25 per cent and heavy cream 40 per cent fat.

It is economical and convenient to give either $\frac{1}{4}$ of a pint or $\frac{1}{2}$ of a pint of cream a day. This makes the quantity definite, corresponds to the customary quantity which is sold, and will last either one day or two days. Twenty per cent cream is represented by the upper 4 ounces on a quart of milk which has stood twenty-four hours.

The fat having been removed, the chief value of milk to the diabetic patient is lost. The percentage of sugar in sour milk is not much less than in fresh milk.

Rennet may be made from milk, but unless the curd is carefully washed it will contain 2 to 2.5 per cent lactose. When the rennet is made from cream, the lactose is materially diminished. Kefir contains approximately 2.4 per cent milk sugar. Von Noorden says this milk has been of great help in the treatment of diabetes in children.

Bavarian Cream (Diabetic).

Food.	Amount.	Protein, gm.	Fat, gm.	Carbohydrate, gm.	Calories.
Cream, 40 per cent	90 cc.	3	36	3	348
Water	10 "				
Egg, 1	50 gm.	6	6	..	78
Gelatin	2 "	2	..	..	8
Saccharin (to sweeten), Flavoring (to taste)					
		11	42	3	434

Soften the gelatin in cold water, then add to the cream, which has been heated. Stir until dissolved, pour on the beaten egg, cook like soft custard, turn into mold and chill.

Ice cream as made at home contains from 15 to 25 per cent carbohydrate, 4 per cent protein, and 12 per cent fat. (See page 209.)

Ice cream (diabetic), made according to the following formula contains practically no carbohydrate.

Food.	Amount.	Protein, gm.	Fat, gm.	Carbohydrate, gm.	Calories.
Cream, 40 per cent	90 cc.	3	36	3	348
Water	10 "				
Egg, 1	50 gm.	6	6	..	78
Saccharin (to sweeten), Flavoring (to taste)					
		9	42	3	426

Make a soft custard of the egg, 50 cc. of the cream, and the water. Whip the remaining 40 cc. of cream and fold into custard. The saccharin may be added to the egg. The flavoring should be added last.

See also pages 188 and 189.

Cracked Cocoa.—Cracked cocoa (cocoa nibs) makes a most useful drink for diabetic patients. This is not generally appreciated by the profession.

The sample of cracked cocoa (cocoa nibs) used has been

purchased of the S. S. Pierce Company, Boston. It was analyzed by Professor Street, with the following result:

Moisture	283
Protein	14.69
Fat	51.42
Fiber	4.32
Ash	3.88
Starch	7.48
Reducing sugar, as dextrose direct	None
Reducing sugar, as dextrose after inversion	0.94

The cocoa is prepared for the table by adding 1 cupful of the cracked cocoa to 1 quart of water and letting it simmer on the back of the stove all day, adding water from time to time. The strained infusion alone should be taken and not the nutritious grounds or nibs. Professor Street was good enough to analyze the infusion, and wrote me: "The cocoa prepared according to directions contained 0.032 per cent of reducing sugar as dextrose direct and 0.138 per cent of total reducing sugars."

Cocoa shells are extensively used as a beverage. One cup of cocoa shells to 1 quart of water should be used, allow to simmer at least one-half hour. Drink the strained infusion. Cocoa shells are far cheaper than cocoa nibs.

Desserts can often be made with gelatin and this may be flavored with coffee, lemon, rhubarb, or cracked cocoa. In preparing such desserts if saccharin is used it should be added as late as possible during the cooking for it is apt to become bitter with heat. It is always a safe rule to add too little rather than too much saccharin.

Extracts.—In making agar jelly, gelatin and other desserts, flavoring extracts can be used. The general rule is 1 teaspoonful of extract to 1 pint of liquid. The standard extracts and vegetable colorings can be employed.

Sea moss farina and Irish moss are usually allowable for diabetic patients. Most of the carbohydrate in these materials is in the form of pentosans and galactans, which Swartz[1] has shown to be quite inert in the body. Unfortunately these products are sometimes adulterated with other carbohydrates. This emphasizes the fact that no matter how

[1] Swartz: Trans. Connecticut Acad. Arts and Sci., 1911, **16**, 247.

useful a food may be in itself, one must always be on the lookout for adulteration.

Agar-agar Jelly.

Agar-agar (powdered) 1 teaspoonful.

Water, strained cocoa shells, or coffee, 1½ pints.

Flavoring extract 1 teaspoonful.

Mix agar with a little of the water until it forms a smooth paste. Add rest of water and boil ten minutes. Strain, flavor, color and sweeten with saccharin as desired. Pour into molds and cool at room temperature.

Lemon Jelly (Diabetic).

Food.	Amount.	Protein, gm.	Fat, gm.	Carbohydrate, gm.	Calories.
Lemon juice	30 cc.	..	..	3	12
Water	50 "				
Gelatin	4 gm.	4	..	..	16
Saccharin (to sweeten)					
Cream	30 cc.	1	12	1	116
		5	12	4	144

Soften gelatin in a part of the cold water. Heat the remaining water and lemon juice and pour over the gelatin. Stir until dissolved. Add saccharin, strain into cups. Serve with cream.

Lime juice is used in flavoring. One teaspoonful in a glass of water makes a good beverage in hot weather. One must be very sure that the lime juice is free from sugar or contains but a trace.

Seasoning.—The proper seasoning of the food helps the diabetic patient. So many articles are excluded from the diet that the great variety which is possible in the preparation of the food by the help of seasoning is overlooked. Horseradish, to be sure, contains 10 per cent of carbohydrate, but it would take at least 2 teaspoonfuls to contain a gram, and probably far more. Sour pickles are allowable, and other pickles made from the group of 5 per cent vegetables, provided one is assured that they have been prepared without sweetening. Mint, capers, curry, tarragon vinegar, distilled vinegar, bay leaf, cloves, ginger, mustard, paprika, anise seed,

caraway seed, celery salt and onion extract may all be used as seasoning.

Five Per Cent Vegetables.— Five per cent vegetables furnish the bulk of a diabetic patient's diet and their variety breaks the monotony. Lettuce, endive, chickory and water cress combined with other fresh vegetables furnish salad all the year round. Cabbage is inexpensive and very good. White, green, red, or Chinese cabbage chopped finely, served cooked or raw as cold slaw, may be used. Greens, chopped, can be blended in cooking as, for example, Abyssinian senel and chard, Chinese mustard and spinach. For the last few years we have used lettuce instead of washed vegetables.

Artichokes.— Artichokes are desirable vegetables for diabetics. The French variety with the concentric leaves is to be classed as a 5 per cent vegetable; the Jerusalem artichokes which grow under ground contain 16 per cent carbohydrate.

The starch in Jerusalem artichokes is in the form of levulin and differs from ordinary starch in that when it turns to sugar the sugar is levulose (fruit sugar) rotating light to the left instead of dextrose (glucose) which is dextrorotary.

Inulin and levulose are somewhat better tolerated by diabetics than ordinary starch and its corresponding sugar— glucose. It is often advantageous to give 10 grams of carbohydrate in the form of inulin (65 grams artichokes) to a diabetic either in substitution for other kinds of carbohydrate or in addition to the regular diet every other day. Its effect should be watched.

Dried artichokes, prepared similarly to potato chips, are palatable and keep for months. Their carbohydrate content is about double that of the plain Jerusalem artichokes.

If bees could be induced to live upon artichoke blossoms, the honey they make would be levulose and a few diabetics might tolerate a little of it.

At the New England Deaconess Hospital we have seldom found trouble with canned vegetables but it is often advantageous to use those put up especially for diabetics without the addition of sugar or salt. (See page 236.) The small stringless beans with practically no bean in them at all are perfectly safe for general use as a 5 per cent vegetable.

Standard Diets in Various Forms.—For menus, and recipes which make them possible, I am greatly indebted to Miss Alice Dike, Instructor in Household Economics at Simmons College, to Case No. 765, and to Miss Sigrid Kenseth who has revised the original recipes to make them applicable to present-day needs. The carbohydrate was originally 58 grams, but since the introduction of insulin the diets of most diabetics have been raised to carbohydrate 88 grams, or more. It is an easy matter to add to it. Similarly with more carbohydrate, more calories can be given in the form of fat.

TABLE 34.—A STANDARD HOSPITAL DIET AND ITS ARRANGEMENT IN THREE FORMS. (See p. 183)

	Grams.	Carbohydrate.	Protein.	Fat.	Calories.
Oatmeal	30	20	5	2	
Orange	300	30	0	0	
5 per cent vegetables	600	20	10	0	
Uneedas, 2	12	10	1	1	
Meat	60	0	16	10	
Eggs	2	0	12	12	
Bacon	30	0	5	12	
Butter	30	0	0	25	
20 per cent cream	240	8	8	48	
		88	57	113	1597

The calories furnished amount to about 1600—a maintenance diet for an adult patient weighing about 50 kilograms and a sufficient diet for a patient who leads a quiet life.[1]

Squab. A squab when carefully boned yields 50 grams of meat. This is broiled in an oiled paper case to prevent evaporation, and when served with the escaped juices proves a favorite dish for patients. It contains about 12 grams protein and 5 grams fat. The lean part of a lamb chop yields about 30 grams of meat.

Boiled Dinner.—Corned beef, with cabbage and one other vegetable, served together as a boiled dinner, is most acceptable to male patients. A portion containing 50 to 75 grams of meat and 100 grams of each vegetable makes an excellent meal. Corned beef hash made of meat and vegetables in the same proportion could also be served for variety.

[1] The patient is an adult. Weight, 50 kilograms. If fat in the cream is 40 per cent the calories would amount to 2029.

A Standard Hospital Diet in Three Forms. (Page 182).

Diet I.

Breakfast.	*Dinner.*	*Supper.*
Egg omelet . 1	Steak . . . . 60 gm.	Egg poached . . 1
Bacon . . . 15 gm.	Lettuce and tomato salad with mayonnaise . 100 "	Bacon . . . . 15 gm.
Oatmeal . . 15 "	String beans . . 100 "	Stewed tomatoes . 150 "
20% cream . 80 cc.	Cabbage . . . 100 "	Asparagus . . . 150 "
Butter .. . . 10 gm.	20% cream . . 80 cc.	20% cream . . 80 cc.
Grapefruit . . 100 "	Butter . . . 10 gm.	Butter . . . . 10 gm.
Coffee, bran.	Orange . . . 150 "	Grapefruit . . . 200 "
	Cellu bran, coffee agar jelly, tea, bran.	Bran,
	Uneedas . . . 2	Lemon agar jelly, cocoa shells.
		Uneedas 2

Diet II.

Breakfast.	*Dinner.*	*Supper.*
Scrambled egg. 1	Chicken . . . 60 gm.	Soft boiled egg with mayonnaise . . 1
Bacon . . . 15 gm.	Cauliflower . . 150 "	Bacon . . . . 15 gm.
Shredded wheat	Brussel sprouts . 180 "	Swiss chard . . 180 "
20% cream . 80 cc.	Lettuce . . . 30 " with cucumber. 60 "	Celery . . . . 30 "
Butter . . . 10 gm.	Butter . . . 15 "	Lettuce . . . 30 "
Grapefruit . . 50 "	20% cream . . 80 cc.	20% cream . . 80 cc.
Coffee, bran.	Banana . . . 75 "	Butter . . . . 10 gm.
	Bran, cocoa shells, maple agar jelly.	Strawberries . . 150 "
	Uneedas . . . 2	Tea, bran.
		Uneedas . . . 2

Diet III.

Breakfast.	*Dinner.*	*Supper.*
Bacon . . . 30 gm.	Cod fish . . . 60 gm.	Eggs 2
Oatmeal . . 15 "	Bacon . . . 20 "	Chopped raw cabbage with diabetic mayonnaise . 60 gm.
20% cream . 100 cc.	Stewed tomato . 150 "	Spinach . . . 150 "
Butter . . . 15 gm.	Boiled onion . . 90 "	Butter . . . . 10 "
Grapefruit . . 100 "	Radish . . . 20 "	20% cream . . 80 cc.
Bran, coffee.	Lettuce . . . 40 " with grapefruit salad . . . 100 "	Orange, sliced . . 100 gm.
	Banana . . . 50 "	Cocoa shells.
	20% cream . . 60 cc.	Bran.
	Butter . . . 15 gm.	Uneedas . . . 2
	Lemon and lime agar jelly	
	Bran, coffee.	
	Uneedas . . . 2	

Lunch.

Club sandwich without bread (See also p. 198):	
Chicken	45 gm.
Lettuce	50 "
Tomato	90 "
Bacon	10 "
Butter	15 "
40 per cent cream with clam broth	20 cc.
Bran with mayonnaise, 40 per cent cream	20 "
Cocao shells,	
Bran wafers	2
Grapefruit	100 gm.

Total: Carbohydrate, 10; protein, 17; fat, 39.

When the food values are not given, they can be computed by reference to Tables 35 and 36, the food tables at the end of the book, page 204.

Recipes for Daily Menus.[1]

Broths.—Each pound of beef, veal, chicken or lamb, or 1 pint of clams, should make 1 quart of broth. Let cool, and skim off all fat before serving.

Bouillon.—Bouillon cubes are not advisable because of their high salt content.

Salt:	
Armour's	21 per cent
Steero	39 "
Oxo	62 "

Tomato Bouillon.

Tomato	60 gm.	Bay leaf	½
Broth	1 cup	Clove	1
Onion extract	½ teaspoonful	Celery salt or celery tops	¼ teaspoonful

Mix all ingredients, boil twenty minutes, strain and serve.

Squash Gingerbread.

Vegetable marrow (cooked and mashed)	180 gm.
Butter	20 "
Egg-white	1
Ginger	1 tablespoonful
Cream	60 cc

Salt and saccharin to taste.

Flavor vegetable marrow with salt, melt butter and add it to vegetable, also add ginger. Beat egg and add to mixture. Spread ¼ inch thick and bake for one and a quarter hours in moderate oven. Serve hot with 60 cc of cream whipped stiff and flavored with saccharin.

Food value: Carbohydrate, 8; protein, 11; fat, 28.

[1] Prepared by Miss Sigrid Kenseth, R.N., of the New England Deaconess Hospital and by Mrs. and Miss Leatherbee, of the Leatherbee Diabetic Home.

Bran Cookies.

Washed bran	2 cups
India gum	1 tablespoonful
Mineral oil	1 "

Salt and saccharin to taste.

Ginger, cloves, anise, or caraway seed, ½ teaspoonful, if desired.

Mix dry ingredients and then add bran and mineral oil with enough water to make a stiff dough. Knead with finger tips. Pat out and cut into thin cookies. Bake about forty-five minutes in a moderate oven until crisp.

Cellu-bran Cookies.

Washed bran	2 cups
Cellu-flour	½ cup
India gum	1 tablespoonful
Spice	1 teaspoonful
Mineral oil	1 tablespoonful

Salt and saccharin to taste.

Mix as bran cakes and bake in moderate oven, being careful not to brown cookies.

Cellu-flour Cookies.

Cellu-flour	2 cups
India gum	1 tablespoonful
Flavoring extract or spice	1 teaspoonful

Salt and saccharin to taste.

Mix and bake as above.

Cellu-flour Pie Crust.

Cellu-flour	2 tablespoonfuls
India gum	1 teaspoonful

Salt and enough water to make a stiff dough.

Mix with finger tips and shape pie crust as desired before baking, bake in a moderate oven, being careful not to brown.

Cellu-flour Sponge Cakes.

Egg	1
Water	1 tablespoonful
Extract	½ teaspoonful
Cellu-flour	1–1½ tablespoonfuls

Beat white and yolk of egg separately. To the yolk add water, extract, salt and saccharin. Then add cellu-flour from 1 to 1½ tablespoonfuls, according to the consistency of the yolk. When the mixture is almost brittle add the egg-white, being careful not to beat in too thoroughly. A pinch of baking powder may be used if desired. Bake in a quick oven about fifteen minutes.

Food value: carbohydrate, 0; protein, 6; fat, 6.

Variations.—With strawberries and whipped cream, as allowed in diet, a shortcake can be made; 15 gm. of nuts chopped may be added if allowed in diet, or 30 gm. of blueberries if desired.

Cellu-flour Griddle Cakes.

Egg	1
Water	1 tablespoonful
Cellu-flour	1–2 tablespoonfuls

Salt and saccharin to taste.

Beat white and yolk of egg separately and together add water and cellu-flour, enough to make a fairly firm mixture, salt and saccharin. Fry on a hot griddle and serve with butter allowed in diet or a substitute maple syrup.

Food value: Carbohydrate, 0; protein, 6; fat, 6.

Substitute Maple Syrup.

Water	1 cup
India gum	½ teaspoonful
Maple extract	1 "
Saccharin	

Mix gum with a little water and then gradually add the remainder of cup, beating with an egg-beater until all lumps are removed. Add flavoring, saccharin and extract; serve hot.

Candy.

Agar-agar	4 teaspoonfuls
Water	1000 cc
Flavoring (wintergreen, peppermint, spearmint or vanilla).	

Dissolve agar in water. Bring to a boil and boil twenty minutes. Cool after adding flavoring and saccharin and cut in squares.

Cheese Custard.

Egg	1
Milk	120 cc
Grated cheese	10 gm.

Beat egg, add pinch of salt, milk and cheese. Beat and bake as two custards in a pan of water in oven.

Cream	60 cc
Water (may be used if milk is not allowed in diet)	30 "

Food value with milk: Carbohydrate, 6; protein, 13; fat, 14.
Food value with cream: Carbohydrate, 2; protein, 8; fat, 18.

Cheese Salad.

Cream cheese	15 gm.
Pimento	10–15 "

Dice pimento and mix with cheese allowed. Shape into small balls and serve on lettuce, 25 gm.

Food value: Carbohydrate, 1; protein, 5; fat, 5.

Irish Moss Blanc Mange. Soak small amount of moss in cold water ten minutes. Pour off water and add to moss 60 cc of 40 per cent cream and 120 cc of cocoa shell liquid. Bring to boil and boil until a drop jellies on a cold plate. Then flavor with vanilla, ½ teaspoonful, and saccharin. Strain and mold.

Custard.

Egg	1
Cream	60 cc
Milk	120 "
or	
Cream	60 "
Water	120 "
Flavoring, saccharin, nutmeg if desired.	

Best egg thoroughly, add cream, milk, etc. Bake as two custards in a pan of water. Any combination of milk and cream if figured correctly may be used.

Food value of each custard with milk: Carbohydrate, 4; protein, 6; fat, 11.

Food value of each custard with water: Carbohydrate, 1; protein, 4; fat, 9.

Agar-Agar Jelly.

Agar-agar (powdered)	1 teaspoonful
Water, strained cocoa shells, or coffee	1½ pints
Flavoring extract	1 teaspoonful

Mix agar with a little of the water until a smooth paste. Add rest of water and boil ten minutes. Strain, flavor, color and sweeten with saccharin as desired. Pour into molds and cool at room temperature.

Suggestions:

Vanilla	1 teaspoonful	Mapleine	1 "
Lemon	1 "	Coffee	1 cup
Orange	1 "	Cocoa shells	1 "
Lime	1 "	Peppermint	½ teaspoonful
Raspberry	1 "	Wintergreen	½ "
Strawberry	1 "	Spearmint	½ "
Pineapple	1 "		

Gelatin.[1]—One teaspoonful gelatin to 2 cups of hot water dissolved may be added to 1 teaspoonful of any of the above extracts and saccharin to taste. Gelatin is used very little because of high protein content. Gelatin may be used when agar-agar is too laxative.

Bavarian Cream.—To any of the extracts suggested, when just beginning to jell, beat in whipped cream allowed in diet.

Whips.—To any jellies, when partially jelled, beat in beaten white of egg. Cocoa and coffee together make a mocha whip.

Coffee Spanish Cream.—Dissolve ½ teaspoonful of gelatin in 5 tablespoonfuls of coffee. Pour this on beaten yolk of egg. Add 60 cc of cream and 60 cc of milk, saccharin. Cook as soft custard and when thick add to beaten white of egg. This makes two creams. Chill and mold on ice.

Food value of one cream: Carbohydrate, 2.5; protein, 5; fat, 10.

Spanish Cream.—Use maple, vanilla or other extract and dissolve gelatin in hot water instead of coffee, or use hot cocoa shells instead of hot coffee.

Pudding.

Vegetable marrow or cauliflower	180 gm.
Egg	1
Cream	60 cc

Butter, if desired.

Food value without butter: Carbohydrate, 8; protein, 11; fat, 18.

Snow Pudding.

Lemon juice	1 teaspoonful
Gelatin	1 "
Saccharin	2 grains
Boiling water	½ cup

1 egg-white beaten stiff.

Dissolve gelatin in ½ cup of boiling water, add lemon juice, saccharin. When partly jelled add beaten egg-white. Beat thoroughly and cool.

Food value: Carbohydrate, 1; protein, 3; fat, 0.

[1] Gelatin can be purchased as D-Zerta (p. 237). Each package contains protein 2 grams.

Peach Snow Pudding.

Peaches cooked . . . . . 75 gm.

Remove peaches from juice. Dissolve in the juice 1 teaspoonful of gelatin. Add enough boiling water to make 1 cup. Add small amount of pink coloring. When partially jelled beat with an egg-beater until light and frothy. Then stir in peaches.

Food value: Carbohydrate, 10; protein, 0; fat, 0.

Custard Sauce (for any desserts).

Cream or milk . . . . . 30 cc
Egg-yolk . . . . . ½ (saccharin)
Water . . . . . 2 tablespoonfuls

Cook as a soft custard, cool and serve.

Food value with milk: Carbohydrate, 1; protein, 4; fat, 4.

Food value with cream: Carbohydrate, 1; protein, 4; fat, 9.

Ice Cream.

Cream . . . . . 60 cc
Milk . . . . . 60 "
Egg . . . . . 1 "
Saccharin and flavoring.

Beat as an egg-nog and freeze. More milk and cream may be added to make enough for two meals, or cream may be used entirely if milk is not allowed in diet.

Food value: Carbohydrate, 5; protein, 10; fat, 20.

Coffee Ice Cream.

Coffee . . . . . 1 cup
20 per cent or 40 per cent cream . . . . . 45–60 cc
India gum . . . . . 1 teaspoonful
Saccharin to taste.

Dissolve India gum in a little water, add coffee, beat and boil until a smooth consistency. Add cream and saccharin. Put mixture in small saucepan. Place in larger pan of salt and ice. Stir from time to time until mixture freezes and is smooth. Cocoa shells may be used in the same way instead of coffee if desired.

Food value with 20 per cent cream:
Carbohydrate, 1.5 to 2; protein, 1.5 to 2; fat, 9 to 12.

Food value with 40 per cent cream:
Carbohydrate, 1.5 to 2; protein, 1.5 to 2; fat, 18 to 24.

Mousse.—Can be made with strawberries or peaches.

Cream (30 per cent) . . . . . 150 cc
Peaches . . . . . 110 gm.
or
Strawberries . . . . . 165 "
Egg-whites (1 egg-white is sufficient) . . . 2
Gelatin . . . . . 1 teaspoonful
Saccharin to taste.

Dissolve gelatin in 1 teaspoonful cold water. Heat 2 tablespoonfuls of cream and put with gelatin and water. Place in pan of water. Whip the rest of the cream and saccharine together. Whip 2 egg-whites. Add gelatin mixture to whipped cream and then add egg-whites. Put mixture in a mold and place in ice-chest for an hour.

Food value: Carbohydrate, 16; protein, 14; fat, 45.

Ice Cream.

1.

Cream (30 per cent) . . . . . 150 cc
Saccharin to taste.

Whip cream. When moderately well whipped flavor with diabetic vanilla and continue whipping until stiff. Put mixture into mold, pack in salt and ice and leave for from two to three hours. This makes a light, fluffy and quite bulky ice cream.

Food value: Carbohydrate, 8; protein, 8; fat, 45.

2.

Use quantity of cream allowed, diluting with milk if desired.
Flavor with saccharin and vanilla.
Egg, 1, if desired.

Freeze as ordinary ice cream. This makes a less bulky ice cream.

3.

Cream (30 per cent), 120 cc, or quantity allowed for one person.
Saccharin to taste.

Place mixture in bowl. Place bowl in a larger bowl of ice. Whip the cream. Dissolve some George Washington coffee in cold water. Add this to cream and whip until stiff. Add salt to top of ice and put in cold place for one and a half hours. Three times in first fifteen minutes after setting to cool stir mixture with spoon so it will be smooth and not stick to sides of bowl.

Food value for 120 cc cream: Carbohydrate, 6; protein, 6; fat, 36.

4.

Cream (30 per cent), 120 cc, or quantity allowed for one person.
Saccharin and flavoring to taste.

Put mixture in open dish and place in larger dish full of ice and salt. Keep cream there for about two hours, stirring every few minutes with spoon so that the outside will not freeze hard and the inside remain soft.

Food value with 120 cc cream: Carbohydrate, 6; protein, 6; fat, 36.

Blueberry Pie.

Cooked cereal, using quantity allowed in diet.
Blueberries, using quantity allowed in diet, see pp. 76 .
Egg, 1.
Butter and cream as allowed.

This may be made with vegetable marrow instead of cereal.

Rhubarb Pie.—Stew rhubarb, 90 gm., in ¼ cup of water. Thicken with ¼ teaspoonful of India gum. Cool, sweeten with saccharin and put in crust which has been previously baked.

Other fillings may be made the same way, using more India gum if necessary.

		Carbohydrate.
Cranberries	30 gm.	3
Blueberries	65 "	10
Peach	75 "	10

Dessert.—Grate very finely the allowance of Brazil nuts and mix with the allowance of grapefruit. This makes a very pleasing dessert.

If desired 1 tablespoonful of lime juice may be added to the quantity of grapefruit allowed. This makes a change in dessert.

Suggestions:

Eggs.

Fried
Broiled
Scrambled—onion, chives, parsley
Omelet—plain or with asparagus, 60 gm.
Baked
Hard boiled served with spinach
Hard boiled in salad
Scrambled with tomato
Baked in tomato with cheese on top
Stuffed eggs
Dropped eggs
Ham omelet
Egg with dried beef
Spanish omelet

Cheese Omelet.—Beat white and yolk of 1 egg separately. Add to yolk 15 gm. of grated cheese, pinch of salt and 1 teaspoonful of water. Fold in white of egg. Beat stiff. Bake in oven until a golden brown.

Food value: Carbohydrate, 0; protein, 10; fat, 12.

Egg in Nest.—Beat white of 1 egg with a little salt until very stiff. Drop on a tin greased with mineral oil and sink whole yolk into the center of the white. Bake in a quick oven about five minutes until brown.

Tomato Sauce.

1 can of tomatoes. Note the weight.
1 onion and curry powder to taste.

Boil down until right consistency. This may be served as a vegetable, or with eggs, or with an omelet.

Scrambled Egg and Tomato.

Egg 1
Tomato . . . . . 60 gm.

Beat white and yolk separately with a little salt and fold in together. Put into frying pan greased with mineral oil. Cook one minute then add 60 gm. cooked tomato pulp, stirring with a fork until done.

Food value: Carbohydrate, 2; protein, 7; fat, 6.

Fat-free Fish.	**Fat Fish.**	**Canned Fish.**
Cod	Mackerel	Salmon
Haddock	Sword fish	Tuna
Finnan haddie	Smelts	
Flounder	Fresh salmon	
Salt cod	Trout	
Lobster	Halibut, etc.	
Shrimp		

Meat, 30 gm., equals { Fat-free fish, 30 gm. or Fish, 40 gm.
Bacon, 10 " Butter, 6 "

Meat, 30 gm., equals Fat fish, 30 gm.

Meat, 30 gm., equals { Canned salmon, 30 gm.
Canned tuna, 30 "

Fish Chowder.

40 per cent cream	45 cc
Fish	90 gm.
Onion	40 "
India gum	1 teaspoonful
Salt,	
Parsley.	

Cut fish in small pieces and cook with finely chopped onion. Strain and thicken with ½ teaspoonful of India gum, add to onion and fish. Add parsley and salt. Lastly, add cream and heat in a double boiler. Butter may be added if desired.

Food value with milk (60 cc): Carbohydrate, 5; protein, 21; fat, 2.

Food value with 20 per cent cream (60 cc): Carbohydrate, 4; protein, 22; fat, 12.

Food value with 40 per cent cream (45 cc): Carbohydrate, 3.5; protein, 21.5; fat, 18.

Fish Cakes.

Fish—salt cod—(more according to fish in diet)	30 gm.
Bran	2 teaspoonfuls
India gum	½ teaspoonful
Onion extract, few drops, seasoning.	

Mix all together with enough hot water or broth to shape into a cake. Fry in mineral oil until brown.

Food value: Carbohydrate, 0; protein, 6; fat, 0.

Salt cod soaked overnight and cooked can be used, taking cooked weight.

Creamed Tuna Fish.

Tuna fish	60 gm.
Pimento	50 "
Cream	60 cc

Food value: Carbohydrate, 5; protein, 24; fat, 29.

Meat.—Any lean meat can be used in a diabetic diet; pork, fat corned beef and chops are meat in which it is hard to differentiate the fat.

Meat Pie.

Meat	45 gm.
Tomato	90 "
Celery	60 "

Food value: Carbohydrate, 5; protein, 15; fat, 8.

Stew all together in one cup of broth. Pour off the broth and thicken in casserole with cellu-flour crust on it. Bay leaf, parsley and mace may be used as flavoring if desired; if diet is so small that it does not permit the use of onion, onion extract may be used, also celery salt.

Thin Stew.—This may be made as above, but use a smaller amount of India gum in thickening. Any combination of vegetable may be used in making either of the above, but the value must be figured out and deducted from diet.

Meat or Chicken Croquettes.

Meat	60 gm.
Washed bran	1 teaspoonful
India gum	½ "
Broth	1 tablespoonful
Onion extract, a few drops.	

Mix gum and bran together. Add to meat which has been ground up. Add broth, salt, pepper and onion extract. Shape into two croquettes. Fry in deep mineral oil until golden brown.

Food value: Carbohydrate, 0; protein, 16; fat, 10.

Chicken à la King.

Mushrooms	60 gm.	Green pepper	15 gm.
Chicken	45 "	40 per cent cream	50 cc
Pimento	15 "	Broth	1 cup

Cook chicken, vegetables, broth and cream together one-half hour. Pour off liquid and thicken with ½ teaspoonful of India gum. Add to chicken and vegetables and serve.

Food value: Carbohydrate, 3; protein, 15; food, 36.

Club Sandwich.—Butter four bran wafers with 15 gm. of butter, then, using chicken, bacon, etc., as above, make two sandwiches.

Mayonnaise Dressing.

Yolk of egg	1
Mineral oil	3 cups
Juice of lemon	½
Salt, paprika, mustard to taste,	
Distilled vinegar	1–2 tablespoonfuls

Beat yolk, add lemon juice, mustard, salt, paprika, then oil drop by drop until it is thoroughly worked in, not increasing amount until you are sure it will not separate. Add vinegar to proper consistency. Allow 2 dessertspoonfuls daily.

Cooked Greens.

Cabbage	Spinach
Chard	Orach (a variety of spinach)
Beet greens	Mustard greens

Wash greens in several waters and let stand in cold water for an hour. Chop in small pieces and pour on the same fresh boiling water. Cook from eight to twelve minutes. Do not salt until ready to drain. Mustard and chard, when the leaves are quite large, need to boil a little longer.

Combination of Vegetables.

Chopped celery, 1 part

Chopped cabbage, 2 parts.

Boil ten minutes. Drain off water, salt lightly, serve hot, plain, or with butter.

Mustard greens, boiled with spinach, beet greens, chard or orach.

Tomato	1 cup
Boiled cabbage	2 cups

Heat and serve. Canned tomato and okra added to the cabbage makes a change.

Vegetable Soup.

Dice carrots, turnip and onion
Canned peas
Tomatoes
Okra
Canned string beans
Celery

Cook carrots, turnip and onion together until tender, then add the peas and put in double boiler to keep hot. In another kettle cook tomatoes, okra, canned string beans and celery. Weigh out as much as desired of 5 per cent and 10 per cent vegetables and add 1 cup of hot broth.

Boiled Radishes.—Soak radishes in cold water for about an hour, then boil for ten minutes, salt and serve.

Egg Plant.—Egg plant cut in slices ½ inch thick. Sprinkle with a little salt and place in piles under a plate having a weight on top for two hours. Rinse with cold water and dry. Dip each piece into slightly beaten egg, drain and fry in hot spider, greased with mineral oil, until brown. Remove to agate pan and finish cooking in oven.

Boiled Cucumbers.—Peel cucumbers, slice and boil until tender. Mash, season with salt and pepper and serve as summer squash.

Fried Cucumbers.—Peel and cut in slices ½ inch thick. Dip in slightly beaten egg, drain and fry in hot spider, greased with mineral oil, until brown. Bake in oven until tender.

Boiled or Fried Marrow.—Proceed as with cucumbers.

Purslane.—Serve in a salad with French dressing.

French Dressing.

Mineral oil	⅓ cup	Salt
Distilled vinegar	⅔ cup	Pepper
Saccharin	¼ grain	Cayenne
Enough paprika to color.		

Mix in a small bottle which can be kept on the ice. Shake well before using.

Tomato Relish.

Tomato	1 cup
Onion juice	1 teaspoonful
Distilled vinegar	1 tablespoonful
Pinch of cloves, ginger, salt and pepper.	

Boil until thickened and add ¼ grain saccharin when taken from stove.

Scalloped Tomato.

Tomato	100 gm.
Washed bran	1 tablespoonful
Onion juice, clove, salt and pepper.	

Bake this together. Celery can be mixed with the tomato for variety.

Fried Fresh Tomatoes.—Slice the tomato, not peeled, and fry on hot spider, greased with mineral oil, until brown and tender. Tomatoes that are a little underripe hold their shape better than ripe ones.

Cream Soup.

Strained pulp of leeks	120 gm.
Warm water	½ cup
India gum	1 teaspoonful
Cream	30 gm.

Boil the leeks and the warm water in which the India gum has been beaten together.

Add cream, and season lightly with salt and pepper.

Food value: Carbohydrate, 5; protein, 3; fat, 6.

Oil Dressing.—Equal parts of oil and vinegar. Beat with a little ice. Add salt and pepper. Remove ice and serve at once.

Any 5 per cent vegetables or 10 per cent vegetables may be served cold on lettuce, with mayonnaise or French dressing.

Suggestions:

Asparagus	60 gm.
String beans	60 "
String beans \ Beets /	30 "
Tomato plain	60 "
Tomato stuffed with cucumber,	
Chopped cabbage	60 "
Cabbage, 60 gm., with green pepper	15 "
Cabbage, 60 gm., with pimento	15 "
Radishes	30 "
Cucumber	30 "
Beets and carrots chopped	60 "
Lobster salad	
Shrimp salad	
Chicken and celery salad	

Stuffed Tomato Salad. Weigh tomato after scooping inside. Chop up cucumber and celery about 50 gm. Mix together with mayonnaise. Season, refill shell and serve on lettuce leaf. Other vegetables could be used chopped up in place of cucumber and celery.

Chicken Salad.

Chicken (chopped)	45 gm.
Celery (chopped)	60 "

Mix with diabetic mayonnaise and serve on crisp lettuce, 50 gm.

Oyster Stew.

40 per cent cream	60 cc
Oysters	6
Water	1 cup
Butter	10 gm.
Salt, etc.	

Stew oysters in 1 cup of water. Add cream and butter when oysters are cooked. Heat, add seasoning and serve.

Food value: Carbohydrate, 6; protein, 8; fat, 33.

Cream of Asparagus Soup.

Asparagus	90 gm.
40 per cent cream	30 cc
Cold water	1 cup
India gum	½ teaspoonful
Butter	5 gm.

Cook asparagus in water, strain, add water to cream and thicken with India gum, ½ teaspoonful. Put asparagus through sieve, add to the above and serve.

Food value: Carbohydrates, 4; protein, 3; fat, 16.

Cream of Tomato Soup.

Tomato	120 gm.
40 per cent cream	40 cc
India gum	2 teaspoonfuls
Water	½ cup
Butter	5 gm.

Heat tomato, strain and weigh. Mix India gum with cold water. Add cream and beat with turbin beater. Heat in double boiler (salt, cayenne, paprika). Add two mixtures at last.

Food value: Carbohydrate, 5; protein, 3; fat, 20.

Most any combination can be worked out of 20 per cent cream or milk to use in these recipes, when 40 per cent cream is not allowed in diet. Cream of celery and spinach soup are very good.

Gravy.—Thicken 1 cup of broth with ½ teaspoonful of India gum. Beat with a turbin egg-beater until all lumps are removed. Season as desired and serve hot.

Tomato Sauce.

Bay leaf, Tomato } 30 gm. stewed with ¼ cup of hot water.

Strain and thicken with India gum. Season with salt, pepper and a few drops of onion extract. Serve hot.

Vegetables.—Fried Egg Plant.—Cut egg plant in fairly thin slices. Parboil in salted water. Drain off water, dry thoroughly and fry in deep hot mineral oil. Serve with butter.

Stuffed Peppers.

Vegetable marrow	150 gm.
or	
Winter squash	100 "
Meat	60 "
Butter	10 "
Onion, if desired	15 "

Mix together and stuff two moderately sized peppers.

Food value: Carbohydrate, 6; protein, 19; fat, 18, with onion.

Baked Stuffed Tomato.—Weigh tomato, 90 gm., scoop out inside and stew together with celery, 30 gm., onion, 15 gm., butter, 5 gm., bay leaf, salt and pepper. Refill shell and bake in oven fifteen to twenty minutes.

Cold Slaw.—Chop up cabbage finely and mix with diabetic mayonnaise dressing, 1 dessertspoonful. Serve cold.

New England Deaconess Hospital Recipe for Cooking Oatmeal.

Oatmeal	1 cup
Water	4 cups

Bring to boiling-point and steam in double boiler for three hours. Divide cooked weight by 8 to learn the dry weight of the oatmeal. Patients will do well to weigh out 30 gm. of oatmeal they are accustomed to use in their own household and prepare it either as above or according to their own recipe and then determine what this quantity weighs when cooked.

For the following School Lunches, Restaurant Lunches and Dinner-pail Lunches I am indebted to Miss Somerville in charge of the Diabetic Wards of the New England Deaconess Hospital, Miss Winterbottom, the Wandering Diabetic Nurse for children and to Dr. Priscilla White. The composition of the lunches can be made exact or approximate according to the pains taken in their preparation and selection. The patient will recognize whether portions served at a restaurant exceed his allowance.

School Lunches.

Food Values Approximate.

Carbohydrates 7 grams, protein 5 grams, fat 10 grams.

1.

Lister's muffins (made with Lister's equalized flour)	2
Bacon or cheese	10 gm.
Butter	5 "

2.

Saltines	2
Cheese	10 gm.
Olives	3

3.

Saltines	2
Butter	6 gm.
Olives	6

4.

Uneeda	1
Cheese	15 gm.
Butter	5 "
Celery	30 "

5.

Uneedas	2
Cheese	15 gm.
Orange	50 "

Carbohydrates 7 grams, protein 5 grams, fat 20 grams.

1.

Lister's muffins (made with Lister's equlized flour)	2
Cheese or bacon	10 gm.
Butter	10 "

2.

Saltines	2
Cheese	15 gm.
Olives	3

3.

Saltines	2
Cheese	15 gm.
Butter	10 "

4.

Uneeda	1
Butter	10 gm.
Cheese	30 "
Celery	30 "

5.

Lettuce	60 gm.
Green pepper	30 "
Nuts	10 "
Cheese	10 "

Carbohydrate 15 grams, protein 8 grams, fat 10 grams.

1.

Lister's muffins (made with Lister's equalized flour)	2
Butter	5 gm.
Cheese or bacon	10 "
Orange	100 "

2.

Uneedas	2
Cheese	10 gm.
Olives	2

3.

Saltines	2
Cheese	7 gm.
Banana	50 "
Nuts	7 "

4.

Lettuce and Mayonnaise Sandwich:	
Bread	15 gm.
Orange	60 "

5.

Uneedas	2
Lettuce	60 gm.
Cheese	10 "
Nuts	5
Green peppers	30 gm.

Restaurant Lunches.

1.

	C.	P.	F.
Lamb chop, 2	0	16	10
Lettuce and tomato salad	10	5	0
Uneedas, 2	10	1	1
Butter, 1 square	0	0	8
Orange	10	0	0
Coffee with cream	1	1	6
	31	23	25

2.

Clear soup	0	0	0
6 oysters	4	6	1
Chicken or steak	0	16	10
1 square of butter	0	0	8
Tomato and lettuce salad	10	5	0
Ice cream (plain)	20	4	14
Cheese, 1 square	0	4	6
1 soda cracker	4	0	0
Coffee with cream	1	1	6
	39	36	45

3.

	C.	P.	F.
Milk, ½ pint	12	8	8
5 Uneedas or 1 Shredded Wheat	25	3	3
	37	11	11

4.

Club Sandwich with 1 slice of toast:

Lettuce	60 gm.	2	1	0
Tomato	60 "	2	1	0
Bacon	15 "	0	3	8
Chicken	30 "	0	8	3
Butter	10 "	0	0	8
Toast	30 "	18	3	0
½ grape fruit		10	0	0
Coffee with cream		1	1	6
		33	17	25

5.

Oyster Stew:

Milk	180 cc	9	6	6
Oysters	6	4	6	1
12 oyster crackers		15	1	1
Butter	20 gm.	0	0	13
1 small orange or ½ banana		10	0	0
Coffee with cream		1	1	6
		39	14	27

6.

Clear soup	0	0	0
Fish, 1 large serving	0	24	8
Potato, size of 2 eggs, baked	12	2	0
Radishes 5			
Olives 4			
Lettuce 90 gm. (average serving)	3	2	0
Celery 90 " (average serving) ½ bunch	3	2	0
Coffee with cream	1	1	6
1 banana	20	0	0
	39	31	14

7.

Lobster		20	13
Lettuce and tomato salad	10	5	0
Uneeda, 2	10	1	1
Butter, 10 gm.	0	0	8
Fresh berries or fresh pineapple	15	0	0
Coffee with cream	1	1	6
	36	27	28

8.

	C.	P.	F.
½ grapefruit	10	0	0
Chicken salad:			
Chicken	0	24	9
Lettuce	5	2	0
Salad dressing			
Celery	5	2	0
Crackers and cheese	10	1	1
Coffee and cream	1	1	6
	31	30	16

9.

Lettuce	60 gm.	2	1	0
Banana	25 "	5	0	0
Orange	60 "	6		
Grapefruit	60 "	3		
Fresh peach	50 "	8		
Fresh pineapple	50 "	5		
Whipped cream	60 "	2	2	24
Toasterettes	4	5	1	1
Cheese	45 gm.	0	12	17
Coffee and cream		1	1	6
		37	17	48

10.

Bacon	15 gm.	0	3	8
Carrot	90 "	6	2	0
Turnip	90 "	6	2	0
Spinach	90 "	3	2	0
Potato	60 "	12	2	0
Butter	10 "	0	0	8
Banana and cream (½ banana)		10	0	0
Coffee and cream		2	2	12
		39	13	28

Dinner-pail Lunches.

1.

Sandwich Lunch:				
Bread	30 gm. (cut 2 slices very thin)	18	3	0
Lettuce	60 "	2	1	0
Eggs	2[1]	0	12	12
Butter	10 "	0	0	8
Banana	100 "	20	0	0
Coffee with cream		1	1	6
		41	17	26

[1] In place of eggs may use meat, 60 grams, or cheese, 45 grams.

2.

Sandwiches made with Lister's Equalized Flour:

		C.	P.	F.
Lister equalized muffins	3	6	6	6
Butter	15 gm.	0	0	13
Meat	60 "	0	16	10
Coffee with cream		1	1	6
Tomato soup	120 gm.	8	2	0
1 banana	100 "	20	0	0
		35	25	35

3.

Uneedas	6	30	3	3
Butter	10 gm.	0	0	8
Cheese	45 "	0	12	17
1 small orange or tangerine		1	1	6
Coffee with cream		10	0	0
		41	16	34

4.

Stew:

Potato	60 gm.	12	2	0
Meat	75 "	0	20	13
Turnip	60 "	4	1	0
Carrot	60 "	4	1	0
Thicken with Uneeda	1	5	1	1
Butter	10 gm.	0	0	8
1 banana	75 "	15	0	0
		40	25	22

5

Chowder:

Fish	60 gm.	0	12	0
Milk	240 cc.	12	8	8
Butter	51 gm.	0	0	13
Potato	30 "	6	1	0
Uneedas	2	10	1	1
Orange	100 "	10	0	0
		38	22	22

These "Dinner-pail Lunches" will serve as suggestions. Obviously the values for fat can be increased very readily with butter and cream.

CHAPTER XXVI.

FOODS AND THEIR COMPOSITION.

A. DIABETIC FOODS.

The improvement in the treatment of diabetes owes much to the recent dissemination of knowledge regarding the composition of foods. To the United States Government we are indebted for an excellent monograph by Atwater and Bryant entitled "The Chemical Composition of American Food Materials, Bulletin No. 28, Revised Edition," which was first issued in 1906. This can be purchased by sending ten cents in coin to the Superintendent of Documents, Washington, D. C.

The State of Connecticut, from its Agricultural Experiment Station in New Haven, has also published excellent special reports on diabetic foods, and from year to year adds analyses of new preparations. So far these have been distributed upon request. Professor Street formerly and Prof. E. M. Bailey recently who have been intimately concerned in these investigations have been kindness itself not alone to me, but to my inquisitive patients.

A large number of analyses of Mexican foods has been compiled by Quinones.[1]

No Particular "Diabetic" Food is Recommended.—Whereas the analyses of many so-called diabetic foods are recorded in Table 36, no particular food is recommended. The inclusion of any particlar food in this list is not to be regarded as in any sense an official approval or recommendation of this food.

What is a "Diabetic" Food? -A suitable diet for a diabetic patient depends upon so many variable factors, particularly the tolerance of the individual, that no general definition

[1] Quinones: La Diabetes, su Tratamiento, Mexico, 1925, p. 109.

of a "diabetic" food can be satisfactorily fixed. The discovery of insulin, for example, has materially modified both the theory and practice of diabetic dietetics.

The narrow confines of the diabetic diet have greatly stimulated the manufacture of so-called diabetic foods. These are often serviceable, but are to be employed with discretion. Their use should be discouraged at the beginning of treatment. The patient should never become dependent upon special diabetic foods, for they are often unobtainable, always make him conspicuous, and when he acquires a disgust for foods of this class it is all the harder to abide by the original diet. When the patient buys one of these foods, unfortunately he is often given a list of other diabetic foods and a new diabetic diet list, and confusion in the diet frequently results. The patients under my care who have done best either never use special diabetic foods or use only a few varieties. Such foods to be of service to the physician or to the dietitian should bear correct statements of the percentages of protein, fat, and carbohydrate which they contain; and under no circumstance should the label bear any statements which convey the impression that such foods may be eaten without restriction.

The high content of protein is one of the most serious drawbacks to diabetic foods. Formerly when it was not realized that from 100 grams protein 50 grams or more of carbohydrate might be formed, these special foods with low actual carbohydrate content were considered a great boon. Today we look at the matter differently.

B. COMPOSITION OF COMMON FOODS.

The following food tables were prepared for me under the supervision of Prof. E. M. Bailey of the Connecticut Agricultural Experiment Station situated in New Haven, Connecticut. Prof. Bailey makes the following comments upon Tables 35 and 36.

"In the table 'Composition of Common Foods' many of the analyses are based largely on the authority of Atwater and Bryant's compilation. In substituting or adding other

analyses frequent reference has been made to Prof. Sherman's 'Food Products'[1] which is also largely quoted from the authority just named. Leach, 'Food Inspection and Analysis'[2] and various reports and bulletins of the Connecticut Experiment Station have also been freely consulted.

"The general plan of arrangement of items in the table has been to present those foods which are essentially protein, fat, and carbohydrate in the order named. In choosing analyses many discrepancies are found between the various authors. In such cases the analysis which represents the average of the greatest number of individual analyses or the one which, for one reason or another, seems preferable, has been used.

"The significance of the term *protein* in this table is *nitrogen X 6.25* except in the case of milk and milk products where the factor 6.38 is more correct and has been used. *Fat* means substances soluble in ether or 'ether extract.' It is probable that many of the figures for fat in baked products are too low. Where new analyses have been inserted fat has been determined by an improved method,[3] which gives results considerably higher. *The term 'carbohydrate' is to be accepted generally in the sense of 'nitrogen-free extract' which is the percentage obtained by deducting the sum of the percentages of water, ash, protein, fat, and fiber from 100 per cent.* Whenever the sense of 'carbohydrate' in the table is known to be other than that just stated the explanation is given in a footnote.

"In Table 36, analyses of special foods are given. These are taken largely from our Bulletin 286.

"The general significance of the terms protein, fat, and carbohydrate in this table is the same as already explained for common foods. *Protein*, however, in those products known or declared to be made from gluten, has been estimated on the basis of the factor 5.7 and under 'Protein Preparations' protein in casein products has been estimated using the factor 6.38. The *carbohydrate* group is subdivided into two parts but it should be understood that total carbohydrate is the sum of the two. The idea of the separation is to show

[1] The Macmillan Company, New York, 1918.
[2] Wiley & Son, New York.
[3] Connecticut Exp. Station Bull., 1917, **200**, 133.

how much of the total carbohydrate is available, the figure in the column headed 'starch' representing this available portion so far as it has been determined or can be stated. Thus Barker's Gluten Food A contains 12.4 per cent of total carbohydrate; 2.6 per cent is certainly available but the availability of the 9.8 per cent has not been determined. Wherever the figures in the starch column includes water-soluble carbohydrate, as for example, Cheltine Diabetic Food, the figure given probably represents all of the carbohydrate that is utilized in human digestion.

"Calories have been calculated generally on the basis of total carbohydrate in the conventional way. In some instances, where much of the carbohydrate is regarded as unavailable or where the 'fat' is largely mineral oil and indigestible, calorie yields have not been estimated."

TABLE 35.—COMPOSITION OF COMMON FOODS.

MEAT PRODUCTS.

Name and description of food.	Protein, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories per 100 gms.
Beef, fresh:				
Brisket, medium fat, edible portion	15.8	28.5	..	319
Chuck rib, edible portion, all analyses	19.0	13.4	..	197
Flank, edible portion, all analyses	19.6	21.1	..	268
Loin, edible portion, all analyses	19.0	19.1	..	247
Neck	20.7	12.7	..	197
Plate	16.8	26.9	..	309
Ribs, edible portion, all analyses	17.8	24.6	..	293
Round	20.9	10.6	..	179
Rump, lean	20.9	13.7	..	207
Shank, fore	21.4	8.1	..	158
hind	21.7	8.7	..	165
Shoulder and clod, edible portion, all analyses	20.0	10.3	..	173
Soup stock	5.8	1.5	..	36
Miscellaneous cuts, free from visible fat	22.4	2.9	..	116
Brain, edible portion	8.8	9.3	..	119
Heart, edible portion	16.0	20.4	..	248
Kidney, as purchased	13.7	1.9	Trace	72
Liver, as purchased	20.2	3.1	2.5[1]	119

[1] Largely, or in part, glycogen.

TABLE 35.—COMPOSITION OF COMMON FOODS.—(*Continued.*)

MEAT PRODUCTS—*Continued.*

Name and description of food.	Protein, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories, per 100 gms.
Lungs, as purchased	16.4	3.2	..	94
Marrow, as purchased	2.2	92.8	..	844
Sweetbreads, as purchased	16.8	12.1	..	176
Suet, as purchased	4.7	81.8	..	755
Tongue, edible portion	18.9	9.2	..	158
Beef, cooked:				
Roast	22.3	28.6	..	347
Steak, round	27.6	7.7	..	180
sirloin	23.9	10.2	..	187
tenderloin	23.5	20.4	..	278
Beef, canned:				
Corned[1]	26.6	11.4	..	209
Dried and smoked[2]	32.6	7.5	..	198
Kidneys, stewed	18.4	5.1	2.1	128
Luncheon beef	27.6	15.9	..	254
Roast	25.9	14.8	..	237
Sweetbreads	20.2	9.5	..	166
Tongue, ground	21.4	25.1	..	312
whole	19.5	23.2	..	287
Tripe	16.8	8.5	..	144
Beef, corned and pickled:				
Corned beef, all analyses, edible portion	15.6	26.2	..	298
Spiced beef, rolled	12.0	51.4	..	511
Tongue, edible portion	12.8	20.5	..	236
Tripe	11.7	1.2	Trace	58
Beef, dried, salted, smoked, edible portion	30.0	6.5	..	179
Veal, fresh:				
Breast, edible portion, all analyses	20.3	11.0	..	180
Chuck, edible portion, all analyses	19.7	5.8	..	131
Flank, edible portion, all analyses	20.1	12.7	..	195
Leg, edible portion, all analyses	20.7	6.7	..	143
cutlets, edible portion	20.3	7.7	..	151
Loin, edible portion, all analyses	19.9	10.0	..	170
Rib	20.2	9.4	..	165
Rump	19.8	16.2	..	225
Shoulder	20.7	4.6	..	124
Heart, as purchased	16.8	9.6	..	154
Kidney, as purchased	16.9	6.4	..	125
Liver, as purchased	19.0	5.3	..	124
Lungs, as purchased	17.1	5.0	..	113
Lamb, fresh:				
Breast, edible portion	19.1	23.6	..	289
Leg, hind, medium fat, edible portion	19.2	16.5	..	225
Loin, without kidney and tallow, edible portion	18.7	28.3	..	330
Shoulder, edible portion	18.1	29.7	..	340
Lamb, cooked:				
Chops, broiled, edible portion	21.7	29.9	..	356
Leg, roast	19.7	12.7	..	193
Lamb, canned:				
Tongue, spiced, cooked, edible portion	13.9	17.8	..	216

[1] Average, 3.4 per cent salt (sodium chloride).

[2] Average, 9.7 per cent salt (sodium chloride).

TABLE 35.—COMPOSITION OF COMMON FOODS.—*(Continued.)*

MEAT PRODUCTS—*Concluded.*

Name and description of food.	Protein, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories, per 100 gms.
Mutton, fresh:				
Chuck, edible portion, all analyses	14.6	36.8	..	390
Leg, hind, medium fat, edible portion	18.5	18.0	..	236
Loin, without kidney and tallow, edible portion	16.0	33.1	..	362
Shoulder, medium fat, edible portion	17.7	19.9	..	250
Heart, as purchased	16.9	12.6	..	181
Kidney, as purchased	16.5	3.2	..	95
Liver, as purchased	23.1	9.0	5.0[1]	193
Lungs, as purchased	20.2	2.8	..	106
Mutton, cooked:				
Leg roast, edible portion	25.0	22.6	..	303
Mutton, canned:				
Corned	28.8	22.8	..	320
Tongue	24.4	24.0	..	314
Pork, fresh:				
Ham, lean	25.0	14.4	..	230
Ham, medium fat, edible portion	15.3	28.9	..	321
Head cheese, edible portion	19.5	33.8	..	382
Loin (chops), lean, edible portion	20.3	19.0	..	252
Loin (chops), medium fat, edible portion	16.6	30.1	..	337
Shoulder, edible portion	13.3	34.2	..	361
Side, lard and other fat included, edible portion	9.4	61.7	..	593
Side, lard and kidneys not included, edible portion	9.1	55.3	..	534
Brains, as purchased	11.7	10.3	..	140
Heart, as purchased	17.1	6.3	..	125
Kidney, as purchased	15.5	4.8	0.7	108
Liver, as purchased	21.3	4.5	1.4[1]	131
Lungs, as purchased	11.9	4.0	..	84
Pork, pickled, salted or smoked:[2]				
Ham, lean, smoked, edible portion	19.8	20.8	..	266
Ham, medium fat, smoked, edible portion	16.3	38.8	..	414
Ham, luncheon, cooked	22.5	21.0	..	279
Shoulder, medium fat, smoked, edible portion	15.9	32.5	..	356
Pig's tongue, pickled, edible portion	17.7	19.8	..	249
Pig's feet, pickled, edible portion	16.3	14.8	..	198
Salt pork, clear fat	1.9	86.2	..	783
Bacon, smoked, all analyses, edible portion	10.5	64.8	..	625
Ham, deviled	19.0	34.1	..	383
Sausage:				
Arles, edible portion	26.8	50.6	..	563
Bologna, edible portion	18.7	17.6	0.3[3]	234
Frankfort	19.6	18.6	1.1[4]	250
Pork, as purchased	13.0	44.2	1.1[5]	454
Deerfoot Farm, cooked (analysis furnished by manufacturer)	19.9	54.2	0.3	569
Pork and beef, as purchased	19.4	24.1	..	295

[1] Largely, or in part, glycogen.

[2] The range of salt content for cured pork products may be taken as 3 to 5 per cent.

[3] Carbohydrate range, 0.2 to 3.1 per cent.

[4] Carbohydrate range, 0.0 to 6.6 per cent.

[5] Carbohydrate range, 0.0 to 8.6 per cent.

TABLE 35.—COMPOSITION OF COMMON FOODS.—(*Continued.*)

Name and description of food.	Protein, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories, per 100 gms.
POULTRY.				
Poultry, fresh:				
Chicken, broilers, edible portion	21.5	2.5	..	109
heart, as purchased	20.7	5.5	..	132
gizzard, as purchased	24.7	1.4	..	111
liver, as purchased	22.4	4.2	2.4[1]	137
Fowls, edible portion	19.3	16.3	..	224
Goose, edible portion	16.3	36.2	..	391
Goose liver, edible portion	16.6	15.9	3.7[1]	224
Turkey, edible portion	21.1	22.9	..	291
FISH PRODUCTS.				
Fish, fresh:				
Alewife, whole, edible portion	19.4	4.9	..	122
Bass, black, edible portion	20.6	1.7	..	98
red, edible portion	16.9	0.5	..	72
sea, edible portion	19.8	0.5	..	84
striped, edible portion	18.6	2.8	..	100
Blackfish, edible portion	18.7	1.3	..	87
Bluefish, edible portion	19.4	1.2	..	88
Butterfish, edible portion	18.0	11.0	..	171
Cod, edible portion	16.7	0.3	..	70
steak, edible portion	18.7	0.5	..	79
Eels, salt water, edible portion	18.6	9.1	..	156
Flounder, edible portion	14.2	0.6	..	62
Haddock, edible portion	17.2	0.3	..	72
Halibut, edible portion	18.6	5.2	..	121
Herring, edible portion	19.5	7.1	..	142
Mackerel, edible portion	18.7	7.1	..	139
Perch, edible portion	19.0	2.4	..	98
Pickerel, edible portion	18.7	0.5	..	79
Porgy, edible portion	18.6	5.1	..	120
Salmon, edible portion	22.0	12.8	..	203
Shad, edible portion	18.8	9.5	..	161
Shad roe, as purchased	20.9	3.8	2.6	128
Smelt, edible portion	17.6	1.8	..	87
Trout, brook, edible portion	19.2	2.1	..	96
Trout, lake, edible portion	17.8	10.3	..	164
Whitefish, edible portion	22.9	6.5	..	150
Fish, preserved or canned:				
Cod, salt, "boneless," as purchased[2]	27.7	0.3	..	114
Haddock, smoked, edible portion	23.3	0.2	..	95
Halibut, smoked, edible portion[3]	20.7	15.0	..	218
Herring, smoked, edible portion[4]	36.9	15.8	..	290
Mackerel, salt, edible portion[5]	17.3	26.4	..	307
salt, canned, as purchased	19.6	8.7	..	157
salt, canned in oil, edible portion	25.4	14.1	..	229
Salmon, canned, edible portion	21.8	12.1	..	196
Sardines, canned, edible portion	23.0	19.7	..	269
Sardines, canned in mineral oil, edible portion	22.8	2.7[6]	..	116

[1] Largely, or in part, glycogen.

[2] Contains 11.0 per cent ash, largely salt.

[3] Contains 15.0 per cent ash, largely (12.1 per cent) salt.

[4] Contains 13.2 per cent ash, largely (11.7 per cent) salt.

[5] Contains 12.9 per cent ash, largely (10.4 per cent) salt.

[6] Total oil present, 13.3 per cent; approximately 20 per cent (= 2.7 per cent), digestible.

TABLE 35.—COMPOSITION OF COMMON FOODS.—(*Continued.*)

FISH PRODUCTS—*Concluded.*

Name and description of food.	Protein, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories, per 100 gms.
Fish, preserved or canned:				
Sturgeon, caviare, preserved, Russian, as purchased	30.0	19.7	7.6	328
Tunny (tuna), as purchased	21.7	4.1	..	124
canned in oil, edible portion	23.8	20.0	0.6	278
Turtle meat, canned	23.4	0.7	..	100
Shellfish, etc., fresh:				
Clams, long, in shell, edible portion	8.6	1.0	2.0[1]	51
round, in shell, edible portion	6.5	0.4	4.2[1]	46
Crabs, hard shell, whole, edible portion	16.6	2.0	1.2[1]	89
Crayfish, edible portion	16.0	0.5	1.0[1]	73
Lobster, edible portion	16.4	1.8	0.4[1]	83
Mussels, in shell, edible portion	8.7	1.1	4.1[1]	61
Oysters, in shell, edible portion	6.2	1.2	3.7[1]	50
Scallops, as purchased	14.8	0.1	3.4[1]	74
Terrapin, edible portion	21.2	3.5	..	116
Turtle, green, edible portion	19.8	0.5	..	84
Shellfish, etc., canned:				
Clams, long, as purchased	8.3	0.4	2.7[1]	48
round, as purchased	8.9	0.8	0.9[1]	46
Crabs, as purchased	15.8	1.5	0.7[1]	80
Lobster, as purchased	18.1	1.1	0.5[1]	84
Oysters, as purchased	8.8	2.4	3.9[1]	72
Shrimp, as purchased	25.4	1.0	0.2	111
AMPHIBIA.				
Frog's legs, edible portion	15.5	0.2	..	64
GELATIN.				
Gelatin	84.2[2]	0.1	None	338
EGGS.				
Eggs, fresh:[3]				
Hen, whole egg, edible portion	13.4	10.5	..	148
white	12.3	0.2	..	51
yolk	15.7	33.3	..	363
Duck, whole egg, edible portion	13.3	14.5	..	184
white	11.1	Trace	..	44
yolk	16.8	36.2	..	393
Goose, whole egg, edible portion	13.8	14.4	..	185
white	11.6	Trace	..	46
yolk	17.3	36.2	..	395
Turkey, whole egg, edible portion	13.4	11.2	..	154
white	11.5	Trace	..	46
yolk	17.4	32.9	..	366
Guinea fowl, whole egg, edible portion	13.5	12.0	..	162
white	11.6	Trace	..	46
yolk	16.7	31.8	..	353
Plover, whole egg, edible portion	10.7	11.7	..	148
Turtle, fresh water	18.1	11.1	..	172
sea	18.8	9.8	..	163

[1] Largely, or in part, glycogen.

[2] Nitrogen × 5.55.

[3] In shell eggs the shell comprises from 10 to 17 per cent of the weight of the whole egg; water content ranges from 60 to 67 per cent. Sea-turtle eggs contain about 76 per cent water.

TABLE 35.—COMPOSITION OF COMMON FOODS.—(*Continued.*)

EGGS—*Concluded.*

Name and description of food.	Protein, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories, per 100 gms.
Eggs, edible portion, cooked:				
Hen, boiled	13.2	12.0	..	161
whites	12.3	0.2	..	51
yolks	15.7	33.3	..	363
Eggs, dehydrated, average	40.0	43.7	..	556

DAIRY PRODUCTS, ETC.

Milk:				
Milk, whole	3.3	4.0	4.8	68
condensed (evaporated, concentrated)	6.9	8.2	9.9	141
sweetened, condensed (sweetened evaporated, sweetened concentrated)	7.9	9.0	54.6[1]	331
skimmed	3.4	0.3	5.1	37
sweetened, condensed	9.1	1.0	59.1[2]	282
Buttermilk	3.6	0.5	4.1	35
Kephir	3.1	2.0	1.6	37
Kumiss[3]	2.8	2.1	5.4	51
Cream, "heavy" (approximately 40 per cent)	2.1	41.0	1.5	383
"light" (approximately 20 per cent)	2.8	22.0	2.7	220
heavy, sour	4.1	41.6	1.5	397
Whey	1.0	0.3	5.0	27
Milk powder (dried milk):				
From whole milk	25.3	25.3	37.5	479
From partly skimmed milk	25.8	14.5	49.9	433
From skimmed milk, average	34.6	1.9	50.9	359
Malted milk (milk powder with malted cereal) average	13.8	6.8	71.9	404
Cheese:				
American, pale	28.8	35.9	0.3	440
red	29.6	38.3	..	463
Camembert	21.0	21.7	..	279
Cheddar	26.4	32.7	3.0	412
Cheshire	32.5	26.1	4.5	383
Cottage	20.9	1.0	4.3	110
Cottage, Jewish	27.9	9.2	None	194
Dutch	37.1	17.7	..	308
Edam	24.1	30.3	4.6	388
Full cream	25.4	30.3	2.0	382
Limburger	23.0	29.4	0.4	358
Neufchatel	18.7	27.4	1.5	327
Pineapple	29.9	38.9	2.6	480
Roquefort	22.6	29.5	1.8	363
Skimmed milk	31.5	16.4	2.2	282
Swiss	27.6	34.9	1.3	430
Ice cream, typical	3.8	12.6[4]	19.6	207

[1] Cane sugar, 40.6 per cent; milk sugar, 14 per cent.

[2] Cane sugar, 40.9 per cent; milk sugar, 18.2 per cent.

[3] According to Van Slyke (Leach: Food Inspection and Analysis, p. 174), Kumiss, from cows' milk, contains lactose, 5 per cent; protein, 4.1 per cent; fat (calculated), 1.2 per cent.

[4] Standards for fat in different States vary from 8 to 14 per cent.

TABLE 35.—COMPOSITION OF COMMON FOODS.—(*Continued.*)

Name and description of food.	Protein, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories, per 100 gms.
FATS AND OILS.				
Fats and Oils:				
Butter,[1] average	1.5	84.6	None	767
Oleomargarine,[2] average	0.8	92.4	None	835
Nut margarine,[3] average	1.4	84.8	None	769
Salad oils and cooking fat, typical	Trace	99.7	None	897
SOUPS AND BROTHS.				
Soups, home-made:				
Bean	3.2	1.4	9.4	63
Beef	4.4	0.4	1.1	26
Chicken	10.5	0.8	2.4	59
Clam chowder	1.8	0.8	6.7	41
Meat stew	4.6	4.3	5.5	79
Soups, broths, etc., canned:				
Asparagus, cream of	2.5	3.2	5.5	61
Bouillon, beef	2.2	0.1	0.2	11
clam, typical	1.0	0.1	0.6	7
Celery, cream of	2.1	2.8	5.0	54
Chicken gumbo	3.8	0.9	4.7	42
soup	3.6	0.1	1.5	21
Consommé	1.4	0.1	0.4	8
Corn, cream of	2.5	1.9	7.8	58
Julienne	2.7	..	0.5	13
Mock turtle	3.0	1.0	5.7	44
Mulligatawny	3.7	0.1	5.7	39
Oxtail, edible portion	3.7	1.3	7.1	55
Pea soup	3.6	0.7	7.6	51
Pea, cream of green	2.6	2.7	5.7	58
Tomato	1.8	1.1	5.6	40
Turtle, green	6.1	1.9	3.9	57
Vegetable	2.9	..	0.5	14
Bouillon cubes:				
As purchased, average analysis[4]	11.4	1.8	5.8	85
Prepared as directed, average analysis[5]	0.2	Trace	0.1	1
Clam extract:				
As purchased	23.2	0.2	11.8	142
Prepared as directed[6]	0.5	Trace	0.3	3
Yeast extract, as purchased	31.3	0.2	12.5	177
CEREAL PRODUCTS, ETC.				
Alimentary pastes:				
Macaroni	13.4	0.9	74.1[7]	358
" cooked	3.0	1.5	15.8[7]	89
Noodles	11.7	1.0	75.2	357
Spaghetti	12.1	0.4	75.9	356
Vermicelli	10.9	2.0	72.0[7]	350

[1] Average salt content, 1.6 per cent; range, 0.2 to 4.1 per cent.
[2] Average ash content (largely salt), 0.9 per cent; range, 0.4 to 3.1 per cent.
[3] Average ash content (largely salt), 2.9 per cent; range, 1.1 to 6.1 per cent.
[4] Average salt content, 70.2 per cent.
[5] Average cube weighs 3.8 gms.; 1 cup of broth is assumed to weigh 240 gms.; salt content of prepared broth, 1.1 per cent.
[6] Salt content, 0.4 per cent.
[7] Includes fiber.

TABLE 35.—COMPOSITION OF COMMON FOODS.—(*Continued.*)

CEREAL PRODUCTS, ETC.—*Continued.*

Name and description of food.	Protein, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories, per 100 gms.
Bread, soft:				
Bread, alfalfa	10.6	1.3	64.0	310
brown	5.4	1.8	47.1[1]	226
corn (Johnnycake)	7.9	4.7	46.3[1]	259
Graham	8.9	1.8	51.0	256
peanut	33.6	12.8	19.7	328
rye	9.0	0.6	52.7	252
rye, Jewish	9.1	1.1	52.0	254
whole rye	11.9	0.6	34.7	192
rye and wheat	11.9	0.3	51.5[1]	256
wheat, average of many analyses	9.2	1.3	52.6	259
wheat, whole	9.7	0.9	48.5	241
Buns, hotcross	7.9	4.8	49.7[1]	274
Biscuit, homemade	8.7	2.6	54.6	277
Maryland	8.4	5.6	58.8	309
soda	9.3	13.7	52.6[1]	371
Rolls, all analyses	8.9	4.1	56.1	297
Bread, hard, and crackers:				
Bread, white, toasted	11.5	1.6	61.2[1]	305
Zwieback	9.8	9.9	73.5[1]	422
Crackers, Boston (split)	11.0	8.5	70.3	402
butter	9.6	10.1	71.2	414
cream	9.7	12.1	69.1	424
egg	12.6	14.0	66.2	441
flatbread	14.9	0.5	73.6[1]	359
Graham	10.0	9.4	72.3	414
oatmeal	11.8	11.1	67.1	416
oyster	11.3	10.5	70.3	421
pilot	11.1	5.0	73.9	385
pretzels	9.7	3.9	72.3	363
saltines	10.6	12.7	68.0	429
soda	9.8	9.1	72.8	412
water	11.7	5.0	75.3	393
Pastry, etc.:				
Cake, coffee	7.1	7.5	62.8	347
cup	5.9	9.0	68.2	377
frosted	5.9	9.0	64.8[1]	364
fruit	5.9	10.9	64.1	378
gingerbread	5.8	9.0	62.6	354
sponge	6.3	10.7	65.9[1]	385
Cookies	7.0	9.7	73.2	408
Doughnuts	6.7	21.0	52.4	425
Fig bars	4.6	6.6	68.1	350
Ginger snaps	6.5	8.6	75.3	405
Lady fingers	8.8	5.0	70.4	362
Macaroons	6.5	15.2	64.1	419
Pie, apple	3.1	9.8	42.8[1]	272
cream	4.4	11.4	51.2[1]	325
custard	4.2	6.3	26.1[1]	178
lemon	3.6	10.1	37.4[1]	255
mince	5.8	12.3	38.1[1]	286
raisin	3.0	11.3	47.2[1]	303
squash	4.4	8.4	21.7[1]	180

[1] Includes fiber.

TABLE 35.—COMPOSITION OF COMMON FOODS.—*(Continued.)*

CEREAL PRODUCTS, ETC.—*Continued.*

Name and description of food.	Protein, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories per 100 grms.
Pastry, etc.—Concluded:				
Pudding, Indian meal	5.5	4.8	27.5[1]	175
rice custard	4.0	4.6	31.4[1]	183
tapioca	3.3	3.2	28.2[1]	155
Wafers, miscellaneous	8.7	8.6	74.1	409
vanilla	6.6	14.0	71.3	438
Breakfast foods:				
Barley preparations:				
Cream of Barley	11.1	1.6	76.1	363
Farwell & Rhines' Barley Crystals	11.5	1.3	75 2	359
Quaker Scotch Brand Pearled Barley	9.5	0.9	76.2	351
Corn (maize) preparations:				
Cerealine	6.9	0.4	79.9	351
E-C Corn Flakes, Toasted	6.6	0.3	78.6	344
F. S. Granulated Hominy	8.0	1.0	77.1	349
Hecker's Cream Hominy	9.8	0.4	77.3	352
H-O New Process Hominy	8.0	0.3	79.8	354
Jackson's Roman Meal	13.3	3.4	66.1	348
Jersey Corn Flakes	8.5	0.3	82.3	366
Kellogg's Toasted Corn Flakes	6.4	0.2	78.8	343
Korn Kinks	7 4	0.4	77.9	345
Nichols' Snow White Samp	7 8	0.3	77.7	345
Post Toasties	6 6	0.3	79.4	347
Quaker Best Yellow Corn Meal	7 5	0.8	78.7	352
Quaker Corn Puffs	8 7	0.3	78.5	352
Quaker Hominy Grits	7 9	0.5	77.7	347
Quaker Toasted Corn Flakes	6 8	0.4	79.9	350
Ralston Hominy Grits	9 0	2.9	75.4	364
Street's Perfection Hominy	7 9	1.3	77 9	355
Sunbeam Pearl Hominy	9 4	0.6	75 0	343
Sunseal Cream Corn Meal	8 9	1.0	77.2	353
Sunseal Hominy Grits	8 5	1.2	77.8	356
Sunseal Sunny Corn	8 3	0.4	78.2	350
Washington Corn Crisps	7 8	0.2	76.8	340
Oat preparations:				
Bestovotes	16.2	6.6	63.1	377
Bufceco Rolled Oats	15.1	6.8	64.0	378
Fruited Oats	13.1	4.9	68.2	369
Grandmother's Crushed Oats	14.9	6.5	65.4	380
Health Brand White Oats	13.8	7.8	64.5	383
Hecker's Cream Oat Meal	15.6	5.6	64.6	371
Hornby's Steam Cooked Oat Meal	16.1	6.7	64.1	381
Keen & Robinson's Granulated Scotch Oatmeal	13.7	9.1	64.1	393
Leggett's Premier 15 Minute Oat Flakes	17.2	5.4	63.7	372
McCann's Irish Oat Meal	15.1	8.7	64.9	398
Mother's Crushed Oats	15.6	6.1	64.9	377
Paw-Nee Rolled Oats	15.8	6.7	64.0	380
Purity Rolled Oats	16.3	6.1	61.1	365
Quaker Oats	15.9	6.0	64.5	376
Robinson's Patent Groats	12.8	8.6	67.7	399
Scotch Porage Oats	13.3	9.6	64.9	399
Sovereign 15 Minute Oat Flakes	16.5	5.8	64.0	374
White Rose Rolled Oats	14.3	8.0	64.8	388

[1] Includes fiber.

TABLE 35.—COMPOSITION OF COMMON FOODS.—(*Continued.*)

CEREAL PRODUCTS, ETC.—*Continued.*

Name and description of food.	Protein, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories, per 100 gms.
Breakfast foods:—Continued.				
Rice preparations:				
Comet Cereal	7.2	0.3	80.7	354
Cook's Flaked Rice	7.8	0.1	78.9	348
Cook's Malto Rice	7.6	0.2	80.2	353
Kellogg's Toasted Rice Biscuit	10.1	0.3	80.7	366
Kellogg's Toasted Rice Flakes	10.0	0.4	81.3	369
Milk Rice	6.9	0.2	77.2	338
Quaker Puffed Rice	7.6	0.2	79.5	350
Rye preparations:				
Cream of Rye	12.0	1.6	71.8	350
Kellogg's Toasted Rye Flakes	11.4	1.5	76.2	364
Ry-Krisp	14.0	1.7	74.4	369
Wheat preparations:				
Alber's Wheat Flakes Mush	11.1	2.1	73.4	357
Cero-Vita	8.9	0.7	82.0	370
Cinnamon Rusks	10.3	7.2	71.7	393
Cream of Wheat	11.5	0.9	73.7	349
Cresco Grits	17.8	1.4	68.6	358
Crystal Wheat	11.3	2.0	73.6	358
Dieto Rusks	15.9	9.1	66.1	410
Force	10.6	1.1	73.7	347
F. S. Farina (Quaker Farina)	10.2	0.9	74.6	347
Fruited Wheat	15.6	2.3	66.2	348
Grandmother's A. & P. Farina	10.8	0.6	75.0	349
Granola	13.9	0.8	76.3	368
Granose Biscuit	10.3	1.6	71.1	340
Granose Flakes	10.3	3.9	75.4	378
Grape Nuts	11.5	0.6	74.2	348
Hecker's Farina	10.0	0.7	75.9	350
Holland Rusk	12.1	5.1	70.4	376
Jireh Frumenty	12.3	1.7	77.3	374
Jireh Whole Wheat Farina	12.9	2.3	74.6	371
Kellogg's Breakfast Toast	13.6	1.9	74.9	371
Kellogg's Krumbles	12.0	1.2	72.3	348
Kellogg's Toasted Wheat Biscuit	14.2	1.4	74.7	368
Kellogg's Toasted Wheat Flakes	9.3	1.1	80.5	369
Kellogg's Zwieback	14.3	1.6	76.1	376
Leggett's Premier Farina	11.1	0.9	73.3	346
Malt Breakfast Food	13.8	1.5	72.7	360
Manana Gluten Breakfast Food	42.6	2.0	43.6	363
Mapl-Flake	9.3	1.2	74.7	347
Mother's Wheat Hearts	10.7	1.1	74.1	349
Pettijohn's Breakfast Food	9.1	2.0	74.9	354
Pillsbury Best Cereal	11.5	0.7	75.9	356
Quaker Cracked Wheat	9.3	2.3	73.3	351
Quaker Puffed Wheat	13.1	1.8	70.2	349
Quaker Wheat Berries	14.0	2.0	71.6	360
Ralston Health Food	11.9	1.7	71.5	349
Ralston Wheat Food	11.3	1.8	73.1	354
Sanitas Granuto	10.1	1.7	81.6	382
Saxon Wheat Food	12.8	1.7	74.4	364
Shredded Wheat Biscuit	11.0	1.4	75.0	357
Street's Perfection Farina	10.3	1.1	74.9	351
Triscuit	11.0	1.4	73.9	352
Vitos	11.1	1.0	75.6	356

TABLE 35.—COMPOSITION OF COMMON FOODS.—(*Continued.*)

CEREAL PRODUCTS, ETC.—*Continued.*

Name and description of food.	Protein, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories, per 100 gms.
Breakfast food:—Concluded:				
Wheat preparations:				
Wheatena	11.3	2.8	74.2	367
Wheatlet	12.8	1.6	72.3	355
Whole Grain Wheat (prepared)	6.6	0.8	23.7	128
Zest	9.0	1.2	75.3	348
Wheat bran preparations:				
Ballard's Obelisk Sanitary Edible Bran	17.3	5.4	55.7	301
Culp's Capitol Health Bran	13.4	4.3	57.6	323
Health Food Co.'s Wheat Bran	14.3	4.1	56.2	319
Jireh Wheat Bran	16.8	4.8	56.7	337
Johnson's Educator Wheat Bran	15 4	4.7	54.4	322
Kellogg's Sterilized Wheat Bran	16.3	5.2	54.4	330
Wheat bran biscuit and other laxative preparations:				
Bran Biskue	12.1	13.1	61.0	410
Bran-eata Biscuit	9.1	0.9	72.2	333
Bran Zos	13.2	2.5	65.6	338
Brose Good Health Breakfast Food	14.4	4.3	65.5	358
Cerag	11.3	0.9	73.0	345
Cerena	27.8	11.4	46.3	399
Christian's Laxative Bread	10.0	1.4	74.6	351
Christian's Laxative Cereal Flakes	10.4	1.4	72.5	344
Colax	1.1	0.8	82.8	343
Dietetic Bran Biscuit	9.9	5.0	69.1	361
Educator Bran Cookies	8.9	14.5	64.7	425
Educator Bran Meal	12.3	2.8	66.4	340
F. B. A. Laxative Health Biscuit	6.1	1.7	77.3	349
Fruit Nut Cereal	13.5	1.2	72.4	354
Good Health Biscuit (Kellogg)	7.7	1.2	74.5	340
Health Food Wafers	10.0	7.9	65.7	374
India (Digestive) Biscuit	12.8	2.2	66.1	335
Laxa	12.4	2.8	66.6	341
Laxative Biscuit (Kellogg)	16.7	10.8	57.7	395
Mansfield's Agar Agar Wafers	7.1	12.0	69.9	416
Oval Digestive Biscuit (H. & P.)	7.8	16.3	64.5	436
Uncle Sam Health Food	21.3	24.4	40.9	468
Zim	7.4	1.7	74.2	342
Miscellaneous preparations:				
Dieto Nut Cereal	21.6	18.4	51.8	459
Dieto Wheat and Barley Cereal	11.6	2.2	75.7	369
Jireh Wheat Nuts	19.0	15.6	54.5	434
Malabar Manoca	0.6	0.1	84.1	340
Post Tavern Porridge	10.3	0.8	74.5	346
Post Tavern Special	10.9	1.1	76.9	361
Sea Moss Farina	9.1	0.3	59.9	279
Sunbeam Tapioca	0.6	0.1	85.5	345
Trix	14.5	0.2	77.3	369
Trufood (Trufood Co.)	11.5	2.5	77.1	377
Zep (Battle Creek Food Co.)	14.0	2.2	74.6	374
Flours, meals, etc.:				
Barley flour	12.3	2.4	71.3	356
Buckwheat flour	6.4	1.2	77.5	346
Corn flour	8.4	1.8	76.2	355
Corn meal	9.2	1.9	74.4	362
Oat flour	15.1	6.4	65.7	381

TABLE 35.—COMPOSITION OF COMMON FOODS.—(*Continued.*)

CEREAL PRODUCTS, ETC.—*Concluded.*

Name and description of food.	Protein, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories, per 100 gms.
Flours, meals, etc.:—Concluded.				
Potato flour	0.5	0.1	83.0	335
Rice flour	7.3	0.6	79.3	352
Rye flour	6.8	0.9	78.3	349
Rye meal	13.6	2.0	69.7	351
Soy bean flour	42.5	19.9	24.3	446
Soy bean meal	38.3	14.9	26.6	394
Wheat flour, entire	13.8	1.9	71.0	356
Wheat flour, Graham	13.3	2.2	69.5	351
Wheat flour, patent, average	11.4	1.0	74.8	354
VEGETABLES.				
Vegetables, fresh (unless otherwise stated):				
Aralia Cordata (Udo)	1.0	0.2	2.6	16
Artichokes	2.6	0.2	15.9[1]	76
Jerusalem	2.9	0.1	16.4[1]	78
cooked	2.4	0.1	16.5[1]	77
Asparagus	2.1	0.2	2.7	21
Basella	2.5	0.5	1.7	21
Beans, butter	9.4	0.6	29.1[2]	159
cranberry, young pods	0.4	None	0.6	4
medium	1.3	0.6	1.7	17
fancy	1.0	0.1	2.1	13
Lima	7.1	0.7	20.3	116
refugee, young pods	0.5	None	0.8	5
medium	1.3	0.1	3.0	18
fancy	1.1	0.1	1.4	11
string (carbohydrate range, 3.9 to 10 per cent)	2.3	0.3	5.5	34
string, cooked	0.8	1.1	1.9[2]	21
Beets (carbohydrate range, 6 to 10 per cent)	1.6	0.1	8.8	43
cooked	2.3	0.1	7.4[2]	40
Borage (salad plant)	3.0	0.4	0.4	17
Brussels sprouts	1.5	0.1	3.4	21
Burdock	4.5	0.1	7.4	49
Cabbage (carbohydrate range, 3–6.5 per cent)	1.6	0.3	4.5	27
Chinese	1.2	0.1	2.4	15
Carrots (carbohydrate range, 5.9–11.5 per cent)	1.1	0.4	8.2	41
Cassava, root	1.6	0.2	27.1	117
Cauliflower	1.8	0.5	3.7	27
Celeriac	1.8	0.2	6.0	33
Celery	1.1	0.1	3.3[2]	19
root	2.0	0.4	6.3	37
Chard (Swiss)	3.2	0.6	5.0[2]	38
Chayote (tayote)	0.9	0.1	5.9	28
Chenopodium	8.5	1.1	2.7	55
Chicory, root	..	..	15.0	..
leaves, Italian	1.9	0.4	0.8	14
Chinese vegetables:				
Kai Tsoi	1.7	0.2	1.8	16
Bak Toy	1.2	0.1	1.1	10

[1] Chiefly inulin.

[2] Includes fiber.

TABLE 35.—COMPOSITION OF COMMON FOODS.—(*Continued.*)

VEGETABLES—*Continued.*

Name and description of food	Protein, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories, per 100 gms.
Vegetables, fresh (unless otherwise stated):				
Collards	4.5	0.6	6.3[1]	49
Corn	3.1	1.1	19.2	99
Cucumbers	0.8	0.2	2.3	14
Egg plant	1.2	0.3	4.3	25
Endive	1.0	None	2.6	14
Finocchio	1.5	0.1	1.6	13
Greens, beet, cooked	2.2	3.4	3.2[1]	52
dandelion	2.4	1.0	10.6[1]	61
turnip salad	4.2	0.6	6.3[1]	47
Kale	3.0	0.4	2.1	24
sea	1.4	None	3.8	21
Kohl-rabi (carbohydrate range, 3.5–14 per cent)	2.0	0.1	4.2	26
Lambs' quarters	3.8	0.6	1.7	27
Leeks	2.9	0.1	4.0[2]	29
Lettuce	1.2	0.3	2.2	16
Mushrooms[3]	3.5	0.4	6.0	42
Mustard	2.4	0.3	0.3[2]	14
Okra	1.6	0.2	4.0	24
Onions (carbohydrate range, 4–14 per cent)	1.6	0.3	9.1	46
cooked	1.2	1.8	4.9[1]	41
Orach	4.6	0.4	0.2[2]	23
Oyster plant	1.2	0.1	7.0	34
Palmetto cabbage	3.3	0.6	6.1	43
cooked	2.9	0.5	5.6	39
Parsnips (carbohydrate range, 6–14 per cent)	1.6	0.5	11.0	55
Patience (Rumex Patientia)	2.1	0.2	0.1[2]	11
Peas, green, cooked	6.7	3.4	14.6[1]	116
marrowfat, first grade	5.1	..	12.4	..
second grade	6.7	..	11.0	..
third grade	5.9	..	14.5	..
petits pois, first grade	3.4	..	7.0	..
second grade	4.2	..	10.4	..
third grade	4.4	..	10.3	..
sifted, first grade	5.3	..	12.2	..
second grade	5.7	..	13.1	..
third grade	5.6	..	15.5	..
Peppers, Neapolitan	1.1	0.3	5.7	30
sweet, green	0.8	0.1	4.1	21
Potatoes	2.2	0.1	18.0	82
air (tropical Asia)	1.9	0.4	16.3	76
boiled	2.5	0.1	20.3	92
cooked, chips	6.8	39.8	46.7[1]	572
mashed and creamed	2.6	3.0	17.8[1]	109
sweet (carbohydrate range, 16.5–44.5 per cent)	1.8	0.7	26.1	118
cooked	3.0	2.1	42.1[1]	199
Pumpkins (carbohydrate range, 3–14 per cent)	1.0	0.1	4.0	21

[1] Includes fiber.

[2] Starch and sugar.

[3] Protein and carbohydrates largely unassimilable (E. P. J.).

TABLE 35.—COMPOSITION OF COMMON FOODS.—(*Continued.*)

VEGETABLES—*Continued.*

Name and description of food.	Protein, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories, per 100 gms.
Vegetables, fresh (unless otherwise stated):				
Radishes (carbohydrate range, 2.7–7.5 per cent)	1.3	0.1	5.1	27
Rhubarb	0.6	0.7	2.5	19
Roquette (Rocket salad)	0.7	0.4	0.3[1]	8
Rutabagas (carbohydrate range, 3–12 per cent)	1.3	0.2	7.3	36
Sauerkraut	1.7	0.5	3.8[2]	27
Sorrel	2.1	0.2	0.1[1]	11
Spinach	2.1	0.3	2.3	20
cooked	2.1	4.1	2.6[2]	56
Squash	1.4	0.5	8.2	43
Tomatoes, green	1.2	0.2	2.8	18
ripe	0.9	0.4	3.3	20
Truffles	9.1	0.5	7.0	69
Turnips (carbohydrate range, 2.3–18 per cent)	1.3	0.2	6.8	34
Vegetable marrow	0.5	0.1	4.0	19
cooked	0.4	0.1	4.1	19
Watercress	0.7	0.5	3.7	22
Yams	1.6	0.2	23.6	103
Yautia (Tanier)	4.2	0.4	53.0	232
Vegetables, dried:				
Beans	22.5	1.8	55.2	327
carob	6.3	0.6	80.7	353
frijoles	21.9	1.3	65.1[2]	360
Lima	18.1	1.5	65.9[2]	350
mesquite	12.2	2.5	77.1[2]	380
soy	38.3	14.9	26.6[3]	394
Carrots, evaporated	7.7	3.6	80.3[2]	384
Lentils	25.7	1.0	59.2[2]	349
Peas	24.6	1.0	57.5	337
cow	21.4	1.4	56.7	325
Peppers, green	15.5	8.5	63.0[2]	391
red	9.4	7.7	70.0[2]	387
Potatoes, evaporated	8.5	0.4	80.9[2]	361
Tomatoes	12.9	8.1	62.3[2]	374
Vegetables, canned:				
Artichokes (carbohydrate range, 3.2–6.1 per cent)	0.8	..	4.4	21
Asparagus (carbohydrate range, 1.6–3.3 per cent)	1.5	0.1	2.3	16
Beans, baked	6.9	2.5	17.1	119
haricots verts	1.1	0.1	2.0	13
flageolets (carbohydrate range, 9.8–12.4 per cent)	4.6	0.1	11.5	65
Lima (carbohydrate range, 9.6–16.5 per cent)	4.0	3.0	13.4	97
little green	1.2	0.1	2.8	17
red kidney	7.0	0.2	17.3	99
string (carbohydrate range, 1.5–4.5 per cent)	1.1	0.1	3.3	19
wax	1.0	0.1	2.5	15

[1] Starch and sugar.

[2] Includes fiber.

[3] About one-fourth available.

TABLE 35.—COMPOSITION OF COMMON FOODS.—(*Continued.*)

VEGETABLES—*Concluded.*

Name and description of food.	Protein, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories, per 100 gms.
Brussels sprouts	1.5	0.1	2.9	19
Corn[1] (carbohydrate range, 11.7–25.1 per cent)	2.8	1.2	18.2	95
and tomatoes	1.6	0.4	9.1	46
Macedoine (mixed vegetables)	1.4	..	3.9	21
Okra[2]	0.7	0.1	2.9	15
Peas[3] (carbohydrate range, 4.3–17.2 per per cent)	3.6	0.2	8.6	51
Potatoes, sweet	1.9	0.4	40.6	174
Pumpkins (carbohydrate range, 3.6–7.3 per cent)	0.8	0.2	5.6	27
Squash (carbohydrate range, 3.6–12.8 per cent)	0.9	0.5	9.8	47
Succotash (carbohydrate range, 13.9–21.3 per cent)	3.6	1.0	17.7	94
Tomatoes (carbohydrate range, 1–4.5 per cent)	1.2	0.2	3.5	21
Pickles, condiments, etc.:				
Capers	3.2	0.5	5.0	37
Catsup, tomato (carbohydrate range, 3–26 per cent)	1.8	0.2	10.0	49
Chili sauce (carbohydrate range, 14–28 per cent)	..	..	20.0	..
Horseradish	1.4	0.2	10.5[4]	49
Olives, green, edible portion (10 samples)[5]	1.3	12.1	2.5	124
ripe, edible portion (8 samples)[6]	1.4	18.0	2.0	176
Mustard, prepared	4.7	4.1	5.0	76
cereal added (carbohydrate range, 4–15 per cent)	3.5	1.9	7.0	59
Pickles, cucumber	0.5	0.3	2.7[4]	16
mixed	1.1	0.4	4.0[4]	24
spiced	0.4	0.1	21.0	87
Vinegar, cider (carbohydrate range, 0.3–1.5 per cent)	None	None	0.3	1
distilled	None	None	None	..
malt	..	..	0.5[7]	..
spiced salad	..	..	10.0	..
Tarragon	..	..	0.2[7]	..
wine	..	..	0.4	..

FRUITS, BERRIES, ETC.

(*Analyses are of edible portion.*)

Fruits, berries, etc., fresh:				
Apples (carbohydrate range, 9–21 per cent)	0.4	0.5	13.0	58
Apricots	1.0	..	13.4[4]	58
Avocados (alligator pears)	1.1	13.7	7.1[4]	156
Bananas	1.3	0.6	21.0	95
Blackberries	1.3	1.0	8.4	48
Cherries	1.0	0.8	16.5	77
Citrang juice	1.3	..	6.9	33
Cranberries	0.4	0.6	8.4	41

[1] Average, 0.4 per cent salt (NaCl).
[2] Average, 1.1 per cent salt (NaCl).
[3] Average, 0.7 per cent salt (NaCl).
[4] Includes fiber.
[5] Salt, 5.9 per cent.
[6] Salt, 2.1 per cent.
[7] Manufacturer's analysis.

FRUITS, BERRIES, ETC.—*Continued.*

Name and description of food.	Protein, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories, per 100 gms.
Fruits, berries, etc., fresh:—Concluded:				
Currants	1.5	..	12.8[1]	57
Egg fruit	3.4	1.9	41.0	195
Figs	1.5	..	18.8[1]	..
Gooseberries	0.4	..	12.0	..
Grapes	1.3	1.6	14.9	79
Grapejuice (carbohydrate range, 11–20 per cent)	..	..	15.0	..
Grapefruit[2]	0.8	..	8.6	36
Huckleberries	0.6	0.6	16.6[1]	74
Lemons	1.0	0.7	7.4	40
juice	..	..	9.8	..
Loganberries[3]	4.6	0.6	7.2[4]	53
juice[5]	0.6	..	6.8	..
Loquat	0.3	..	23.0	..
Mangoes	..	..	13.0	..
Mulberries	0.3	..	12.0	..
Muskmelons	0.6	0.3	7.2	34
Nectarines	0.6	..	15.9[1]	..
Oranges[6]	0.8	0.2	11.6[1]	51
Orange-lemon juice	0.6	..	1.8	..
Papaya (papaw)	0.8	0.1	6.3	29
Peaches	0.7	0.1	5.8	27
Pears	0.6	0.5	11.4	53
Persimmons	0.8	0.7	29.7	128
Pineapple	0.4	0.3	9.3	42
Plums	1.0	..	20.1[1]	..
Pomegranates	1.5	1.6	16.8	88
Prunes	0.9	..	18.9[1]	..
Quince	0.3	0.1	13.2	55
Raspberries, black	1.7	1.0	12.6[1]	66
red	1.0	..	9.7	..
Sapodilla	0.6	1.4	19.4	93
Sour sop	0.8	0.1	17.2	73
Strawberries	1.0	0.6	6.0	33
Tangelo juice	0.7	..	9.0	..
Watermelons	0.4	0.2	6.7[1]	30
Whortleberries	0.7	0.3	10.0	46
Fruits, berries, etc., dried:				
Apples	1.6	2.2	66.1[1]	291
Apricots	4.7	1.0	62.5[1]	278
Citron	1.5	1.5	78.1[1]	332
Currants	2.4	1.7	74.2[1]	322
Dates	2.1	2.8	78.4[1]	347
Figs	4.3	0.3	74.2[1]	317
Prunes	2.1	..	73.3[1]	..
Raisins	2.6	3.3	76.1[1]	345
Raspberries	7.3	1.8	80.2[1]	366

[1] Includes fiber.

[2] Florida, California and Porto Rico, carbohydrate range, 6.6–8.2 per cent (E. M. Frankel).

[3] Jour. Ind. and Eng. Chem., 1918, **10**, 30.

[4] Invert sugar.

[5] Jour. Ind. and Eng. Chem., 1917, **9**, 1043.

[6] Florida, average of seven analyses, carbohydrate 8 per cent; California, eight analyses, carbohydrate 8.3 per cent (E. M. Frankel).

FRUITS, BERRIES, ETC.—*Concluded.*

Name and description of food.	Protein, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories, per 100 gms.
Fruits, berries, etc., canned; jellies and preserves:[1]				
Apples, crab	0.3	2.4	54.4[2]	240
Apple sauce	0.2	0.8	37.2[2]	157
Apricots	0.9	..	17.3[2]	..
Apricot sauce	1.9	1.3	48.8[2]	215
Blackberries	0.8	2.1	56.4[2]	248
Blueberries	0.6	0.6	12.8[2]	59
Cherries	1.1	0.1	21.1[2]	90
Cherry jelly	1.1	..	77.2[2]	..
Figs, stewed	1.2	0.3	40.9[2]	171
Grape butter	1.2	0.1	58.5[2]	240
Grapefruit	0.5	0.1	8.3	36
Marmalade, orange	0.6	0.1	84.5[2]	341
Peaches	0.7	0.1	10.8[2]	47
Pears	0.3	0.3	18.0[2]	76
Pineapple	0.4	0.7	36.4[2]	154
Prune sauce	0.5	0.1	22.3[2]	92
Strawberries, stewed	0.7	..	24.0[2]	..
Tomato preserves	0.7	0.1	57.6[2]	234

NUTS.

(*Analyses are of edible portion.*)

Nuts:				
Almond	21.0	54.9	15.3	639
Almond butter	22.1	61.5	7.9	674
Beechnuts	21.9	57.4	13.2[2]	657
Brazil nuts	16.8	69.4	5.0	712
Butternuts	27.9	61.2	3.5[2]	676
Cashew nuts	19.1	47.1	26.2	605
Chestnuts	6.2	5.4	40.3	235
Cocoanuts	5.7	50.6	27.9[2]	590
Cocoanut milk	0.4	1.5	4.6	34
prepared	6.3	57.4	31.5[2]	668
Filberts	15.6	65.3	13.0[2]	702
Hickory nuts	15.4	67.4	11.4[2]	714
Lichi nuts	2.9	0.2	77.5[2]	323
Peanuts	25.8	38.6	21.9	538
Peanut butter	29.3	46.5	17.1[2]	604
Pecans	9.6	70.5	15.3[2]	734
Pine nuts, Pignolias	36.5	47.9	4.8	596
Piniones	6.5	60.7	26.2[2]	677
Pinon	14.6	61.9	17.3[2]	685
Sabine	28.1	53.7	8.4[2]	629
Pistachios	24.3	51.1	14.3	614
Walnuts, California	18.4	64.4	11.6	700
black	27.6	56.3	10.0	657
soft shell	16.6	63.4	13.5	691

[1] Jams, jellies, preserves and marmalade contain 47 per cent or more carbohydrate. There is a wide variation in the sugar content of canned fruits. Pie peaches are packed in water while other grades may be found in 30, 40 or even 50 per cent syrup.

[2] Includes fiber.

TABLE 35.—COMPOSITION OF COMMON FOODS.—(*Concluded.*)

ALCOHOLIC BEVERAGES.

Name and description of food.	Protein, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories, per 100 gms.
Distilled liquors[1] (whisky, gin, rum, brandy)	..	..	None or trace	..
Wines,[2] dry (carbohydrate range, trace to 3.6 per cent)	..	..	0.3	..
sweet (carbohydrate range 0.1–40.7 per cent)	..	..	8.0	..
Cordials[3] (creme de menthe, kümmel, benedictine, anisette, chartreuse	..	..	30.0	..
Beer,[4] near (average of several brands)	..	..	5.0	..
Ale[5]	..	..	5.1	..
Malt extract, commercial	..	..	10.6	..
true, concentrated	..	..	71.3	..
Cider[6] (carbohydrate range, 0–13.5 per cent)	..	..	4.5	..

OTHER BEVERAGES.

Tea (0.5 oz. to 1 pt. water)	..	..	0.6	..
Coffee (1 oz. to 1 pt. water)	..	..	0.7	..
Cocoa (0.5 oz. to 1 pt. water)	..	..	1.1	..
(0.5 oz. to 1 pt. milk)	..	..	6.0	..
Carbonated drinks (bottled soda, sarsaparilla, birch beer, root beer, gingerale)	..	..	8.0	..
Chocolate[7]	12.4	52.2	24.8[8]	619
Cocoa[7]	18.3	26.7	37.5[9]	464

[1] Sugar is sometimes added to brandy. One sample examined was sensibly sweet and contained 33.5 per cent of sugar (Connecticut Exp. Sta. Bull. 227, 1920, p. 232). Range of alcohol content, 35 to 50 per cent.

[2] Natural wines contain 6 to 12 per cent alcohol; "fortified" wines, 15 to 20 per cent.

[3] Range of alcohol content, 35 to 50 per cent.

[4] Range of alcohol content for beer, generally 3 to 5 per cent; for prohibition beer (near beer), not over 0.5 per cent.

[5] Range of alcohol content, same as for beer.

[6] Range of alcohol content, generally 2.5 to 6 per cent.

[7] Analysis of food itself; not as prepared for drinking. Sweetened chocolate contains from 50 to 60 per cent of sugar; sweetened cocoa contains from 25 to 50 per cent of sugar.

[8] Starch and sugars, about 10 per cent; availability of remainder doubtful or undetermined.

[9] Starch and sugars, about 14 per cent; availability of remainder doubtful or undetermined.

TABLE 36.—COMPOSITION OF SPECIAL FOODS.

Date of analysis.	Manufacturer or agent and name of product.	Protein, per cent.	Fat, per cent.	Carbohydrate.		Calories, per 100 gm.
				Starch, per cent.	Other carbohydrate, per cent.	
	FLOURS AND MEALS.					
	Herman Barker, Somerville, Mass.:					
1919	Barker's Gluten Food "A"	77.0	0 4	2.6	9.8	361
1919	Barker's Gluten Food "B"	74.0	0 5	5.2	10.1	362
1919	Barker's Gluten Food "C"	73.0	0 4	6.4	9.8	360
	Battle Creek Sanitarium Co., Battle Creek, Mich.:					
1916	Gluten Meal	26.3	1.0	55.0	8.7	369
1916	Gluten Meal	39.3	0.9	41.1	10.1	370
1916	Gluten Meal, 80 per cent	76.6	..	5.8	..	..
	Battle Creek Food Co., Battle Creek, Mich.:					
1925	Gluten Flour	43.2	1.8	39.3[1]	6.4	372
	Callard, Stewart & Watt, London:					
1909	Casoid Flour	82.5	1.6	None	3.1[2]	357
1916	Gluten Flour	73.4	..	None	..	..
	Canada Cereal & Flour Co.:					
1919	Gluten Flour	18.6	4.5	43.9	16.9	358
	Cereal Meal Corporation, St. Louis, Mo.:					
1923	Cereal Meal	19.2	6.6	34.8[1]	23.4	368
	Cereo Co., Tappan, N. Y.:					
1919	Soy Bean Gruel Flour	46.1	18.6	0.9	21.9	443
	Cheltine Food Co., Cheltenham, England:					
1923	Cheltine Diabetic Food	57.9	10.1	16.4[1]	3.3	401
	Curdolac Food Co., Waukesha, Wis.:					
1924	Curdolac Flour	41.1	12.4	4.6[1]	22.5	384
	The Dieto Food Co., New York:					
1914	Pure Whole Wheat Flour	13.5	2.1	62.4	12.0	371
	Efficiency Products Co., Somerville, N. J.:					
1926	Hoffman's Casein Flour	73.0	1.0	0.7[1]	2.5	314
	Empire Flour Mills:					
1919	Gluten Flour	13.1	1.1	59.1	15.5	361
	Farwell & Rhines, Watertown, N. Y.:					
1913	Cresco Flour	18.1	1.0	57.2	10.2	351
1923	Gluten Flour	40.5	1.4	43.2[1]	5.1	368
1925	Gluten Flour	42.1	1.4	41.0[1]	6.3	370
1913	Special Diabetic Food	27.5	2.8	40.0	16.6	362
	Federal Mill & Elevator Co., Lockport, N. Y.:					
1923	Gluten Flour	38.5	1.8	42.3[1]	6.9	367
	Gericke, Potsdam:					
1910	Aleuronat	76.0	3.3	10.5[2]		376
	Golden Rod Milling Co., Portland, Ore.:					
1919	Acme Special Flour	15.1	1.8	61.5	8.6	356
1916	Gluten Flour	14.1	1.3	67.0	..	..

[1] Includes soluble carbohydrate.
[2] Includes fiber.

TABLE 36.—COMPOSITION OF SPECIAL FOODS.—(*Continued.*)

Date of analysis.	Manufacturer or agent and name of product.	Protein, per cent.	Fat, per cent.	Carbohydrate.		Calories, per 100 gm.
				Starch, per cent.	Other carbohydrate, per cent.	
	FLOURS AND MEALS—*Continued.*					
	O. B. Gilman, Boston, Mass.:					
1913	Gluten Flour	43.2	2.0	31.4	13.1	369
	The Health Food Co., New York:					
1919	Almond Meal	50.3	15.4	None	18.0	412
1919	Bran Biskue, Gluten Bran	27.7	10.5	33.8	13.9	396
1919	Diabetic Casein Flour (self-raising)	72.3	0.8	None	5.7	319
1919	Gluten Flour, 40 per cent	39.2	1.1	37.3	13.0	368
1919	Glutosac Gluten Flour	41.5	1.7	36.2	9.1	362
1919	Pronireu (Gluten Griddle Cake Flour)	37.9	1.2	36.6	9.1	345
1914	Protosac Gluten Flour	41.9	2.0	31.5	14.8	370
1919	Protosoy Soy Flour	39.4	18.6	1.9	25.1	433
1919	Pure Washed Gluten Flour	74.9	2.0	3.8	10.0	373
1919	Snow Flake Diabetic Casein Flour	79.2	1.2	None	3.2	340
	Hudon Hebert (Furn'r.):					
1919	Gluten Flour	14.4	2.2	52.2	16.8	354
	Jireh Diabetic Food Co., New York:					
1919	Diabetic Flour	14.8	2.0	50.1	20.7	360
1919	Gluten Flour	14.4	2.1	50.0	21.9	364
1913	Patent Barley	11.4	1.6	67.8	12.4	381
1913	Patent Cotton Seed Flour	49.1	12.7	6.0	15.3	396
1913	Patent Lentils Flour	27.3	1.2	42.6	17.2	359
1913	Protein Flour	31.4	2.0	48.5	8.2	370
1925	"Starch-treated" Flour	13.4	2.1	66.0[1]	7.9	368
1913	Soja Bean Flour	42.3	18.2	None	25.8	435
1924	Soycasein Flour	75.8	3.0	1.4[1]	4.6	354
1906	Wheat and Barley Flour	11.8	1.9	66.2[1]	7.3	358
	Johnson Educator Food Co., Boston, Mass.:					
1911	Educator Standard Gluten Flour	36.6	1.4	40.9	12.8	374
	The Kellogg Food Co., Battle Creek, Mich.:					
1916	Gluten Meal, 20 per cent	24.7	0.9	51.2	14.2	369
1919	Gluten Flour, 40 per cent	47.2	1.0	30.7	10.2	361
1919	Gluten Meal, thoroughly cooked, 40 per cent	43.0	1.5	33.4	12.0	367
1912	Gluten, 80 per cent	74.2	0.9	6.2	8.8	365
1919	Pure Gluten Meal	79.1	0.7	2.6	8.7	368
	La Societe l'Aliment "Essential," Nanterre, France:					
1921	Heudebert, Surazotized Gluten Flour	61.3	2.3	14.0[1]	10.9	366
1921	Heudebert, Gluten Flour with Cacao	53.6	5.8	13.8[1]	14.7	381
	Lister Bros., New York:					
1919	Lister's Diabetic Flour, self-rising	68.3	1.0	None	9.7	321
	Lyster Bros., Whitefield, N. H.:					
1915	Casein Flour	84.5	3.6	None	0.4	372
1916	Diabetic Flour	79.3	3.0	None	..	..
	Loeb's Diabetic Food Bakery, New York:					
1919	Gluten Cracker Meal	36.7	10.9	30.7	11.5	414
1923	Pure Gluten Flour	41.5	2.2	39.7[1]	7.4	374
1923	Special Gluten	73.2	2.0	9.4[1]	8.7	383

[1] Includes soluble carbohydrate.

TABLE 36.—COMPOSITION OF SPECIAL FOODS.—(*Continued.*)

Date of analysis	Manufacturer or agent and name of product	Protein, per cent.	Fat, per cent.	Carbohydrate.		Calories, per 100 gm.
				Starch, per cent.	Other carbohydrate, per cent.	
	FLOURS AND MEALS—*Continued.*					
	MacDowell Bros., Ogdensburg, N. Y.:					
1925	Diaban Diabetic Flour	28.0	18.1	32.1[1]	6.5	429
1925	Diaban Diabetic Flour	26.1	17.4	33.2[1]	10.0	434
	Maple Leaf Milling Co.:					
1919	Gluten Flour	12.7	1.2	61.5	11.5	354
	Thos. Martindale & Co., Phila., Pa.:					
1919	Special Gluten Flour	36.8	1.5	41.4	11.2	371
	Mayflower Mills, Fort Wayne, Ind.:					
1919	Gluten Flour	48.0	1.7	28.6	10.2	363
	A. McFarlane Co.:					
1919	Gluten Flour	12.1	1.4	60.3	14.3	359
	P. McIntosh Co.:					
1919	Gluten Flour	15.1	1.0	63.3	9.3	360
	Theo. Metcalf Co., Boston, Mass.:					
1913	Soja Bean Meal, 18 per cent starch	41.0	20.0	25.0		444
1913	Vegetable Gluten, 8.1 per cent starch	73.3	1.5	5.9	11.0	374
	Northwestern Cereal Co., London, Ont.:					
1919	Gluten Flour	17.1	5.0	42.1	22.0	370
1919	Gluten Flour, 40 per cent	14.2	5.3	38.7	25.6	361
	Phospho Food Co., Los Angeles, Calif.:					
1914	Phospho D & D Special	13.7	2.2	58.6	14.4	367
	Plasmon Co., London, Eng.:					
1922	Arrowroot	19.8	0.1	62.2[1]	2.5	339
	Pieser-Livingston Co., Chicago, Ill.:					
1919	Genuine Gluten Flour	41.4	1.4	36.3	9.8	363
1925	Gluten Flour	42.0	1.7	39.4[1]	7.0	369
	Potter & Wrightington, Boston, Mass.:					
1919	Diet-Ease Gluten Flour	39.6	2.3	36.2	11.8	371
1925	Diet-Ease Gluten Flour	40.6	2.6	38.4[1]	8.9	375
1925	Diet-Ease Gluten Flour	40.1	2.8	40.6[1]	6.5	374
	Pure Gluten Food Co., New York:					
1919	Hoyt's Gluten Flour, over 40 per cent protein	41.8	1.1	33.2	12.1	359
1925	Hoyt's Gluten Flour	43.1	1.9	40.4[1]	5.2	372
1919	Hoyt's Gluten Self-raising Flour, over 40 per cent protein	41.5	0.9	33.4	9.7	346
1919	Hoyt's Gluten Special Flour, 80 per cent protein	77.2	1.2	2.8	10.6	373
	Schulenburg Oil Mill, Schulenburg, Texas:					
1919	Baumgarten Process Allison Flour	50.0	10.0	1.1	21.6	381
1921	Allison Flour (Cotton Seed)	50.4	7.9	8.8[1]	15.2	369
	Soy Bean Food Products Co., San Francisco, Calif.:					
1919	Soy Bean Flour A	41.8	19.4	0.3	24.1	440
1919	Soy Bean Flour B	44.0	14.2	0.8	26.0	411
	Sprague, Warner & Co., Chicago, Ill.:					
1919	Richelieu Gluten Flour	45.3	1.2	31.6	12.5	368

[1] Includes soluble carbohydrate.

TABLE 36.—COMPOSITION OF SPECIAL FOODS.—(*Continued.*)

Date of analysis.	Manufacturer or agent and name of product.	Protein, per cent.	Fat, per cent.	Carbohydrate.		Calories, per 100 gm.
				Starch, per cent.	Other carbohydrate, per cent.	
	FLOURS AND MEALS—*Concluded.*					
	Still Rock Spa, Waukesha, Wis.:					
1919	Curdolac Flour	56.6	2.4	5.1	17.9	340
	G. Van Abbott & Sons, London:					
1913	Almond Flour	24.6	58.6	None	7.9	657
1913	Gluten Flour	68.5	0.9	12.4	6.8	359
1913	Gluten Semola	46.9	2.9	28.2	8.7	361
	Vitæ Health Food Co., Seattle, Wash.:					
1924	Soya Manna	41.1	19.0	None	25.2[1]	436
	Waukesha Health Products Co., Waukesha, Wis.:					
1917	Ayos, the Improved Soja Bean Flour	41.4	16.9	0.6	24.4	418
1919	Hepco Flour	44.0	19.1	0.9	21.4	438
	White Swan Spice Co., Toronto, Can.:					
1919	Diet Flour	8.7	1.3	61.3	16.1	356
1919	Gluten Flour	9.8	1.5	62.3	16.0	366
	Wilson Bros., Rochester, N. Y.:					
1919	Genteel Brand Flour	29.4	2.4	49.2	6.2	361
1913	Gluten Flour, 4/7 Standard	19.0	2.1	54.6	11.8	361
1913	Gluten Flour, Self-raising, 4/7 Standard	15.8	2.0	51.8	13.3	342
1919	Gluten Flour	45.8	2.0	28.6	11.9	364
	"NON-NUTRITIVE" FLOURS, FILLERS, ETC.					
	Dietetic Cellulose Co., Chicago:					
1920	Cellu Flour	None	Trace	None	36.9[2]	..
	Efficiency Products Co., Summerville, N. J.:					
1924	Ecmo Flour	4.1	0.6	None	80.4[2]	..
1926	Hoffmann's Non-nutritive Flour	4.0	0.5	None	80.7[2]	..
	Lister Bros., Inc., New York:					
1924	Lister's Low Caloric Flour	3.9	0.6	None	76.6[2]	..
	Nutrivoid Diabetic Flour Co., Brooklyn, N. Y.:					
1924	Nutrivoid Flour	4.3	0.9	None	78.2[2]	..
	Vitæ Health Food Co., Seattle, Wash.:					
1925	Cellulose Flour	11.6	2.8	None	39.2[2]	..
	PROTEIN PREPARATIONS.					
	Cheltine Food Co., Cheltenham, Eng.:					
1923	Milk Protein	84.5	1.0	None	2.4[3]	357
	Glogau & Co., Chicago, Sole Agents:					
1923	Aleuronat	71.0	5.6	10.7[4]	3.6	391
	Menley & James, New York:					
1913	Glidine	83.3	0.8	None	9.1	377

[1] Includes 10.7 per cent soluble carbohydrate.
[2] Probably largely unavailable.
[3] Lactose.
[4] Includes soluble carbohydrate.

TABLE 36.—COMPOSITION OF SPECIAL FOODS.—(*Continued.*)

Date of analysis.	Manufacturer or agent and name of product.	Protein, per cent.	Fat, per cent.	Carbohydrate.		Calories, per 100 gm.
				Starch, per cent.	Other carbohydrate, per cent.	
	PROTEIN PREPARATIONS—*Concluded.*					
	Norton-Truax, Chicago, Ill.:					
1919	Diaprotein	79.4	1.5	None	1.1[1]	336
1922	Diaprotein, No. 2	79.3	1.6	None	1.2[1]	336
	Plasmon Co., London:					
1923	Milk Proteid	75.9	0.7	None	3.3[1]	322
	SOFT BREADS.[2]					
	American System of Bakeries, Hartford, Conn:					
1921	Gluten Bread	26.2	6.0	23.8[3]	6.8	281
1921	Gluten Bread A	27.8	5.9	27.6[3]	6.1	299
1921	Gluten Bread B	28.5	5.4	27.5[3]	5.7	295
	Barker System of Bakeries, Hartford, Conn.:					
1925	Gluten Bread	16.7	3.6	32.3[3]	6.5	254
	Beroth Bread Shop, Hartford, Conn.:					
1925	Gluten Bread	28.6	4.6	23.3[3]	7.1	278
	Bibeau, Meriden, Conn.:					
1925	Gluten Bread	8.6	1.4	41.8[3]	6.1	239
	Canada Bread Co., Toronto, Can.:					
1919	Gluten Bread	9.9	1.1	34.8	16.5	255
	Community Bake Shop, Norwich, Conn.:					
1925	Gluten Bread	30.9	4.8	22.3[3]	5.8	279
	The Dieto Food Co., New York:					
1914	Dieto Bread, Pure Whole Wheat	8.8	0.4	36.6	11.4	231
	Ferguson Bakery, Boston, Mass.:					
1913	Gluten Bread	22.1	3.1	25.2	10.5	259
	H. and R. Diabetic Foods, Bronx, N. Y.:					
1924	Bread of Low Food Value	9.5	23.3[4]	1.7[3]	27.9	...
	Hallinan's Bakery, New Britain, Conn.:					
1925	Gluten Bread	27.5	5.8	23.4[3]	7.5	287
	The Health Food Co., New York:					
1919	Glutosac Bread	29.8	2.6	29.5	12.3	309
1919	Protosac Bread, No. 1	36.0	4.0	20.5	7.4	292
1919	Protosac Bread, No. 2	27.0	3.5	30.5	8.4	295
	J. Heinbockel & Co., Baltimore, Md.:					
1914	Diabetic Bread for Diabetes	8.6	1.5	40.4	11.7	256
	Jireh Diabetic Food Co., New York:					
1913	Whole Wheat Bread (not fresh)	11.3	0.7	44.9	18.2	304
	Keney Tower Bakery, Hartford, Conn.:					
1925	Gluten Bread	20.6	5.0	29.8[3]	3.3	260
	Levine Bros., New Haven, Conn.:					
1923	Gluten Bread	17.5	3.8	25.7[3]	11.7	254

[1] Lactose.

[2] It should be remembered that ordinary wheat bread contains protein, 9.2 per cent; fat, 1.3 per cent; carbohydrate, 52.6 per cent. (See Table 333, page 931.)

[3] Includes soluble carbohydrate.

[4] About three-fourths of the fat is unavailable.

TABLE 36.—COMPOSITION OF SPECIAL FOODS—(*Continued*).

Date of analysis.	Manufacturer or agent and name of product.	Protein, per cent.	Fat, per cent.	Carbohydrate.		Calories, per 100 gm.
				Starch, per cent.	Other carbohydrate, per cent.	
	SOFT BREADS—*Concluded.*					
	Loeb's Diabetic Food Bakery, New York:					
1919	Casein Bread	40.8	10.8	None	3.4	274
1919	Casein Muffins	45.7	11.4	None	7.0	313
1919	Genuine Gluten Bread	28.4	2.1	28.6	6.9	275
1923	Genuine Gluten Bread	32.6	3.6	27.2[1]	4.4	289
1914	P & L Genuine Glubetic Bread	35.3	4.1	19.2	10.0	294
	Lyster Bros., Whitefield, N. H.:					
1915	Casein Bread	36.6	18.4	None	2.5	322
	Mory's Bakery, New Haven, Conn.:					
1925	Gluten Bread	28.1	3.9	24.0[1]	4.3	260
	Mrs. Root's Food Shop, New Haven, Conn.:					
1925	Gluten Bread	28.9	5.1	23.9[1]	5.1	277
	Schaeffer Bros., Inc., Middletown, Conn.:					
1925	Gluten Bread	27.8	4.5	25.1[1]	5.3	273
	Slinn-Schouldis Co.:					
1919	Gluten Bread	9.2	2.6	39.0	13.4	269
	Washburn-Crosby Co., Minneapolis, Minn.:					
1925	Gluten Bread	23.6	19.5	10.2[1]	13.5	365
	Weston Bakery, Boston, Mass.:					
1915	Gluten Bread	19.0	..	28.2	..	..
	HARD BREAD AND BAKERY PRODUCTS.					
	James Aird:					
1916	Gluten Bread	13.1	0.7	59.8	15.9	362
	Arnaud, Inc., New York:					
1921	Cassava Cakes	1.8	0.2	69.5[1]	11.1	331
	Brusson, Jeune, Villimur, France:					
1921	Gluten Bread	33.8	3.8	45.0[1]	0.4	351
	Callard & Co., London:					
1923	Almond Biscuits, No. 15	34.1	48.6	3.5[1]	2.8	599
1925	Bran and Agar Biscuits ("Cellulon")	10.9	7.0	None	51.5[2]	..
1923	Bran and Almond Biscuits, No. 13	24.4	57.5	2.8[1]	3.8	642
1923	Casoid Biscuits, No. 17	58.3	24.6	0.3[1]	1.7	463
1923	Casoid Rusks, No. 8	54.3	26.6	0.5[1]	4.9	478
1925	Chocolate Biscuits ("Casoid")	23.0	51.6	5.4[1]	9.4	616
1923	Gluten and Almond Biscuits, No. 11	65.4	23.3	3.1[1]	None	484
1923	Gluten Biscuits, No. 9	60.4	23.9	3.4[1]	3.9	486
1923	Gluten Cracknells, No. 7	68.7	14.7	3.4[1]	4.7	440
1923	Gluten Dinner Rolls, No. 6	73.8	7.1	5.2[1]	5.4	402
1923	Kalari Batons, No. 5*a*	44.2	42.5	1.2[1]	0.1	565
1923	Parmesan Cheese Straws, No. 17	31.2	48.9	3.5[1]	6.6	606
1923	Ponos Biscuits, No. 14	60.6	19.2	1.3[1]	2.6	431
1923	Prolacto Biscuits, No. 12	59.8	20.5	0.3[1]	4.7	444
1923	Soup Sippets	54.1	28.7	0.5[1]	7.0	505
1925	Starchless Ginger Biscuits	27.4	56.9	None	7 2	651

[1] Includes soluble carbohydrate.

[2] Probably largely unavailable.

TABLE 36.—COMPOSITION OF SPECIAL FOODS.—(*Continued.*)

Date of analysis.	Manufacturer or agent and name of product.	Protein, per cent.	Fat, per cent.	Carbohydrate.		Calories, per 100 gm.
				Starch, per cent.	Other carbohydrate, per cent.	
	HARD BREAD AND BAKERY PRODUCTS—*Continued.*					
	Canada Bread Co., Toronto, Can.:					
1916	Gluten Health Bread	15.4	3.4	57.9	13.2	376
	Charrasse, Marseilles, France:					
1926	Biscuits au Gluten	35.3	4.8	35.6	17.5	397
	Cheltine Food Co., Cheltenham, Eng.:					
1923	Assorted Biscuits	18 3	16 0	51.5[1]	5.3	444
1923	Brown Rusks	18 2	9 7	51.0[1]	10.8	407
1923	White Rusks	22 7	14 8	48 0[1]	4.6	434
1923	Manhu Diabetic Biscuits	12 9	12.0	61.7[1]	5.6	429
	Chicago Dietetic Supply House:					
1925	Bran Agar Agar Wafers	11.9	5.7	Trace	56.1[2]	..
1925	Cellu Bran Wafers	4 1	24 2[3]	None	41.7[2]	..
1925	Cellu Cheese Wafers	7 8	30 6[3]	None	33.8[2]	..
1925	Cellu Chocolate Wafers	6.5	28.3[3]	2.1	36.3[2]	..
	The Dieto Food Co., New York:					
1914	Dieto Crackers	13 4	9.2	54.8	13.9	411
1914	Dieto Rusks	15.9	9.1	52.1	14.0	410
	Energen Foods Co., Inc., New York:					
1923	Energen New Natural Gluten Bread	33.1	10.1	44.0[1]	4.2	416
	Fougeron, Paris:					
1925	Pain Anti-diabetique	20.9	20.1	34.3	14.6	460
	Fromm & Co., Dresden:					
1913	Almond-form Wafers with Chocolate	4.8	29.0	14.0	48.3	529
1913	Butterbrezeln	12.3	16.5	43.1	19.6	449
1914	Conglutin Drops	50.8	1.1	29.2	6.9	358
1914	Conglutin-Zwieback	14.3	21.3	29.7	27.9	479
1913	Crackers	12.9	7.7	58.2	10.2	395
1913	Eierbiscuit	18.8	11.4	37.5	23.1	420
1913	Haselnuss-Stangen	13.4	16.0	None	60.8	441
1913	Luft Bread	50.9	1.0	23.4	7.3	335
1913	Makronen	14.1	19.4	None	56.2	456
1913	Salt-Stangen	13.0	15.6	39.1	22.1	437
1913	Stangenin	14.0	13.0	51.6	12.8	431
1913	Uni Bread	71.7	1.7	2.9	6.5	340
	Karl Goldscheider, Karlsbad:					
1914	Aleuronat-Conglutin Cakes	26.6	15.6	31.7	19.6	452
1914	Butter-Brezeln	10.5	14.9	43.9	23.6	446
1914	Feinste Cocosnuss-Biskuits für Diabetiker "3.6 per cent carbohydrates"	34.4	45.4	None	13.9	602
1914	Feinste Vanille-Biskuits für Diabetiker, "3.6 per cent carbohydrates"	46.4	30.3	None	16.8	525
1914	Honigküchen für Diabetiker, "3.6 per cent carbohydrates"	40.3	38.8	None	13.9	566
1914	Saccharin-Oblaten ohne Zucker	16.5	22.6	33.5	17.6	474
1914	Tee-Gebäck	7.0	27.3	18.0	42.8	517
1914	Zwieback	21.3	3.6	51.7	13.6	379

[1] Includes soluble carbohydrate.
[2] Probably largely unavailable.
[3] Availability not determined.

Date of analysis.	Manufacturer or agent and name of product.	Protein, per cent.	Fat, per cent.	Carbohydrate.		100 Calories, per gm.
				Starch, per cent.	Other carbohydrate, per cent.	
	HARD BREAD AND BAKERY PRODUCTS —*Continued.*					
	H. and R. Diabetic Foods, Bronx, N. Y.:					
1924	Bran Biscuit	6.6	12.5	2.2[1]	57.0[2]	375
1924	Bran Biscuit, spiced and sweetened	7.6	18.4	2.2[1]	55.6[2]	427
1924	Cellu Lemon Cookies	7.8	27.5	4.0[1]	45.1[2]	475
	Health Food Co., New York:					
1919	Alpha	68.6	8.4	1.0	6.4	380
1919	Alpha No. 1 Best Diabetic Wafer, Casein	48.4	33.5	None	4.9	515
1919	Alpha No. 2 Best Diabetic Wafer	70.5	4.0	1.1	6.3	348
1914	Diabetic Biscuit	35.9	8.8	39.8	6.8	409
1919	Gluten Cracker Dust	44.5	8.8	23.2	11.8	398
1919	Gluten Nuggets	28.8	12.3	32.2	15.4	417
1919	Glutona Bread Sticks	33.4	11.1	30.6	14.1	412
1919	Glutosac Butter Wafers	31.1	8.0	40.4	7.9	390
1919	Glutosac Rusk	34.7	5.6	34.3	12.5	376
1919	Glutosac Wafers, Plain	41.0	7.5	25.1	12.1	380
1919	Glutosac Zwieback	28.8	10.5	33.3	15.2	405
1919	No. 1 Proto Puffs	69.1	4.7	3.3	10.7	375
1914	No. 2 Proto Puffs	53.6	2.1	20.7	11.5	362
1919	Protosac Rusk	32.7	5.0	39.3	7.8	364
1919	Protosoy Diabetic Wafer	46.5	15.5	10.6	14.2	425
1919	Salvia Almond Sticks	32.1	26.1	21.4	9.1	485
	Heintz Food Co., Chicago, Ill.:					
1913	Gluten Biscuits	11.7	18.3	21.4	37.4	447
	Huntley & Palmer, London:					
1916	Akoll Biscuits	53.6	28.3	Trace	6.2	493
	Jacob & Co., Dublin, Ireland:					
1923	Plasmon Oat Biscuit	15.4	20.7	49.3[1]	6.1	470
1923	Plasmon Plain Biscuit	18.6	15.8	52.5[1]	3.9	443
1923	Plasmon Sweet Biscuit	17.8	15.2	53.6[1]	4.6	441
1923	Plasmon Wholemeal Biscuit	20.0	16.8	47.2[1]	6.6	446
	Jireh Diabetic Food Co., New York:					
1913	Diabetic Biscuit	13.2	7.4	49.6	21.2	403
1913	Diabetic Rusks	14.9	8.7	47.0	21.0	410
	Johnson Educator Food Co., Boston, Mass.:					
1913	Educator Gluten Bread Sticks	32.7	7.2	37.5	11.5	392
1919	Gluten Cookies	29.0	11.6	36.5	13.5	422
	The Kellogg Food Co., Battle Creek, Mich.:					
1913	Potato Gluten Biscuit	37.9	0.5	39.5	12.1	363
1919	Pure Gluten Biscuit	78.4	1.5	2.9	6.5	365
1919	40 per cent Gluten Biscuit	40.9	1.6	35.6	10.9	364

[1] Includes soluble carbohydrate.
[2] Probably largely unavailable.

TABLE 36.—COMPOSITION OF SPECIAL FOODS.—(*Continued.*)

Date of analysis.	Manufacturer or agent and name of product.	Protein, per cent.	Fat, per cent.	Carbohydrate.		Calories, per 100 gm.
				Starch, per cent.	Other carbohydrate, per cent.	
	HARD BREAD AND BAKERY PRODUCTS —*Continued.*					
	Laboratoire E. Storage, Marseilles, France (Hygienic Food Co., New York, Distributors):					
1924	Madeleins Lucullus	8.8	23.4	46.9[1]	14.2	490
1924	Vichy Goufrettes	14.8	50.9	13.4[1]	12.9	623
1924	Goufrettes Vanillees	8.8	1.2	81.3[1]		371
1924	Nougatines de Vichy	10.0	28.4	41.0[1]	15.1	520
	Laporte & Gauthier, Somerset, Manitoba, Can.:					
1921	Croustils, Dechloridized	16.6	6.1	64.8[1]	3.3	394
1921	Croustils, Simple	17.1	3.4	66.0[1]	3.8	378
1921	Croustils, Glutenized	30.3	6.7	49.9[1]	3.3	394
	La Societe l'Aliment "Essential," Nanterre, France:					
1921	Heudebert, Bread of Gluten	61.8	6.2	13.2[1]	7.5	386
1921	Heudebert, Aleurone Bread	64.0	5.1	11.5[1]	7.5	378
1921	Heudebert, Special Diabetic Bread	55.5	5 9	19.3[1]	6.6	379
1921	Heudebert, Rolls of Gluten	9.7	8.8	66.1[1]	5.2	403
1921	Heudebert, Rusks of Gluten	10.8	7.6	67.4[1]	5.6	404
	Loeb's Diabetic Food Bakery, New York:					
1919	Aërated Gluten Bread	47.8	11.1	26.8	3.2	411
1923	Aërated Gluten Bread	49.8	12 2	23 6[1]	7.0	431
1919	Diabetic Almond Macaroons	30.4	46 3	0.6	10.5	583
1919	Diabetic Bread Sticks	41.8	3.8	35.4	6.9	371
1919	Diabetic Bread Sticks, Almond	39.4	11.7	31.2	7.1	416
1919	Diabetic Butter Cookies	36.5	12.0	31.1	8.4	412
1919	Diabetic Lady Fingers	47.8	34.1	1.9	3.5	519
1919	Diabetic Sponge Cookies	49.7	33.8	1.9	1.4	516
1919	Gluten Almond Zwieback	41.3	7.8	32.6	7.0	394
1919	Gluten Bread	42.5	11.1	27.7	8.8	416
1916	Gluten Luft Bread	40.6	9.8	29.9	11.3	415
1919	Gluten Zwieback	38.7	3.0	36.1	10.6	368
	Nutrivoid Diabetic Flour Co., Brooklyn, N. Y.:					
1925	Nutrivoid Bran Wafers	5.8	31.1[2]	None	43.2[3]	..
	Pure Gluten Food Co., New York:					
1914	No. 1 Dainty Fluffs	79.9	0.5	10.7	0.5	370
1914	No. 2 Dainty Fluffs	66.3	0.5	21.9	3.0	369
1916	Dainty Fluffs	80.0	0.8	7.7	3.0	370
1914	Gum Gluten Biscuit Crisps	48.1	0.5	31.2	11.5	368

[1] Includes soluble carbohydrate.
[2] Largely mineral oil, unavailable.
[3] Largely unavailable.

TABLE 36.—COMPOSITION OF SPECIAL FOODS.—(*Continued.*)

Date of analysis.	Manufacturer or agent and name of product.	Protein, per cent.	Fat, per cent.	Carbohydrate.		Calories, per 100 gm.
				Starch, per cent.	Other carbohydrate, per cent.	
	HARD BREAD AND BAKERY PRODUCTS —*Continued.*					
	Rademann's Nahrmittelfabrik, Frankfurt:					
1926	Brusson, Jeune Mignonettes	50.8	3.4	36.9[1]	2.8	393
1913	Diabetiker-Biscuit	29.6	19.6	25.9	18.6	473
1926	Diabetiker Casoid Biscuits	57.3	26.9	1.0[1]	3.9	491
1913	Diabetiker-Bretzel	31.4	8.5	40.7	9.4	402
1913	Diabetiker-Cakes	29.6	13.5	39.1	8.1	429
1913	Diabetiker-Dessert-Gebäck	22.2	42.4	5.9	21.6	580
1926	Diabetiker Keks	32.1	15.2	36.0[1]	7.6	440
1913	Diabetiker-Makronen	23.2	48.0	3.0	17.6	607
1913	Diabetiker-Stangen	17.7	44.2	21.4	8.1	586
1926	Diabetiker Zwieback	25.4	12.6	48.1[1]	7.2	436
1913	Käsestangen	9.3	33.7	38.0	8.4	526
1926	Ohneko Biscuits	61.6	22.6	4.2[1]	3.1	479
	R. M. Scott, Ltd., Ipswich:					
1922	Gluten and Almond Biscuit	23.8	19.9	44.5[1]	3.2	465
	James Strachen:					
1916	Gluten Bread	16.9	0.6	52.7	21.3	369
	Therapeutic Foods Co., Inc., New York:					
1924	Aleurone Bread	62.0	1.7	15.4[1]	7.5	355
1923	Charrasse Gluten Bread	42.7	5.8	36.0[1]	5.3	388
1923	Charrasse Gluto-Kola Bread	45.9	6.0	37.3[1]	None	387
1923	Charrasse Gluto-Soja Bread	48.6	6.9	33.3[1]	0.7	393
1923	Charrasse Supreme Bread	45.6	6.9	35.9[1]	0.6	391
1924	Bread of Gluten	71.6	1.5	6.3[1]	7.7	356
1924	Brusson, Jeune Gluten Bread	39.3	1.0	12.8[1]	36.0	361
1925	Gluten Bread	73.0	3.7	5.9[1]	6.9	377
1924	Special Diabetic Bread	63.0	1.1	15.0[1]	8.4	356
	G. Van Abbott & Sons, London:					
1913	Caraway Biscuits for Diabetics	35.6	37.5	8.6	7.3	544
1913	Diabetic Rusks for Diabetics	70.9	0.8	12.6	3.4	355
1913	Euthenia Biscuit	35.8	40.7	6.9	6.3	562
1913	Gluten Biscottes or Rolls	47.1	2.3	29.8	7.7	359
1913	Gluten Bread or Slices	49.4	2.2	27.4	8.2	361
1913	Gluten Butter Biscuit for Diabetics	40.2	33.2	9.0	7.6	526
1913	Ginger Biscuit for Diabetics	34.6	39.4	10.9	5.8	560
1913	Midolia Biscuit	17.6	36.4	13.4	18.2	524
1923	Soya Biscuit	39.2	25.0	11.4[1]	11.8	475
1913	Walnut Biscuits for Diabetics	20.9	57.2	Trace	12.3	648
	Waukesha Health Products Co., Waukesha, Wis.:					
1919	Hepco Dodgers	42.4	16.7	1.0	21.6	411
	Weston's Bakery, Boston, Mass.:					
1915	Gluten Cookies	27.7	..	19.6	..	..

[1] Includes soluble carbohydrate.

TABLE 36.—COMPOSITION OF SPECIAL FOODS.—(*Continued.*)

Date of analysis.	Manufacturer or agent and name of product.	Protein, per cent.	Fat, per cent.	Carbohydrate.		Calories, per 100 gm.
				Starch, per cent.	Other carbohydrate, per cent.	
	HARD BREAD AND BAKERY PRODUCTS —*Concluded.*					
	Woman's Baking Co., Boston, Mass.[1]					
1921	Bran Cookies, Anice	7.4	25.9	5.2[2]	..	..
1921	Bran Cookies, Caraway	8.1	24.2	5.0[2]	..	..
1921	Bran Cookies, Cocoa Nib	8.2	26.9	8.7[2]	..	..
1921	Bran Cookies, Spice	6.6	22.7	9.3[2]	..	..
1921	Bran Muffins	7.3	5.9	5.6[2]	..	..
1921	Cellu Biscuits	3.2	13.2	3.9[2]	..	..
1921	Cellu Cookies, Caraway	5.6	22.5	3.8[2]	32.0	..
1921	Cellu Cookies, Lemon	4.2	24.4	3.9[2]	..	..
1921	Cellu Cookies, Vanilla	4.3	21.3	4.1[2]	..	..
1921	Cellu Kisses	23.0	0.2	2.5[3]	25.2	..
1921	Cellu Muffins	3.8	13.6	3.5[2]	..	..
1921	Cellu Nuts	5.4	28.7	3.6[2]	23.8	..
1921	Cellu Soup Wafers	3.7	25.6	4.2[2]	..	..
	BREAKFAST FOODS.					
	Arnaud, Inc., New York:					
1921	Starchless Breakfast Food	2.0	0.2	70.9[2]	10.3	335
	Battle Creek Food Co., Battle Creek, Mich.:					
1924	Cooked Bran	15.3	4.7	59.2		340
	Brusson, Jeune, Villimur, France:					
1913	Farina au Gluten	30.9	0.6	48.8	8.0	356
	Callard & Co., London:					
1925	Washed Bran	10.4	6.5	2.3[2]	46.4	293
	Curdolac Food Co., Waukesha, Wis.:					
1924	Krinkles	10.8	14.4	4.8[2]	45.5	374
	Dieto Food Co., New York:					
1914	Dieto Nut Cereal	21.6	18.4	39.5	12.3	459
1914	Wheat and Barley Cereal	11.6	2.2	61.4	14.4	369
	Efficiency Products Co., Somerville, N. J.:					
1924	Nut Flakes	4.4	1.0	2.8[2]	75.6[3]	..
1926	Ecmo Breakfast Food	6.4	1.1	2.6[2]	69.1[3]	..
1926	Starch-free Bran	16.7	4.4	2.4[2]	40.8	279
	Farwell & Rhines, Watertown, N. Y.:					
1913	Barley Crystals	11.5	1.3	62.7	12.5	359
1913	Cresco Grits	17.8	1.4	54.1	14.5	358
	Health Food Co., New York:					
1919	Manana Gluten Breakfast Food	44.8	8.7	22.0	12.5	396
1919	Protosoy (Cereal)	40.1	18.2	Trace	24.9	424
	Jirch Diabetic Food Co., New York:					
1913	Whole Wheat Farina	11.7	2.3	59.5	16.3	371
1913	Frumenty	12.3	1.7	65.4	11.9	374

[1] The fat in these products is largely or entirely mineral oil and unassimilable.
[2] Includes soluble carbohydrate.
[3] Largely unavailable.

TABLE 36.—COMPOSITION OF SPECIAL FOODS.—(*Continued.*)

Date of analysis.	Manufacturer or agent and name of product.	Protein, per cent.	Fat, per cent.	Carbohydrate.		Calories, per 100 gm.
				Starch, per cent.	Other carbohydrate, per cent.	
	BREAKFAST FOODS—*Concluded.*					
	Kellogg's Toasted Corn Flake Co., Battle Creek, Mich.:					
1923	Kellogg's Bran Cooked and Krumbled	14.4	3.4	68	.5[1]	362
	Kramer Surgical Stores, New York:					
1926	Breakfast Cereal	32.8	1.3	3.5[2]	47.0[3]	..
	Lister Bros., Inc., New York:					
1924	"Starch-free" Bran	16.4	4.0	1.6[2]	44.4	286
	Loeb's Diabetic Food Bakery, N. Y.:					
1919	Casein Breakfast Cereal	36.6	42.5	0.7	11.0[1]	576
1919	Gluten Breakfast Cereal	29.2	19.4	25.5	17.8	464
	S. S. Pierce Co., Boston:					
1926	Deshell Starchless Agar Flakes	1.9	0.2	None[2]	83.3[3]	..
	Plasmon Co., London:					
1922	Oats	17.3	8.1	57.4[2]	5.9	395
	Pure Gluten Food Co., New York:					
1919	Gluten Breakfast Food	40.8	0.7	35.7	12.3	361
1924	Gluten Flakes (av. of two analyses)	42.5	3.7	14.7[2]	23.1	355
1916	Gum Gluten Granules	39.3	0.9	40.5	11.4	373
1919	Hoyt's Gluten Breakfast Food, 40 per cent protein	46.0	1.8	31.4	10.2	366
1923	Hoyt's Gluten Flakes	44.7	4.4	16.5[2]	18.9	360
1919	Hoyt's Gluten Granules, over 40 per cent protein	43.8	2.6	32.2	10.1	368
1924	Hoyt's Protein Cereal	79.4	1.6	2.9[2]	8.9	379
1924	Hoyt's Special Gluten Flakes	74.1	1.9	5.9[2]	8.1	370
	The Spa, Waukesha, Wis.:					
1924	Malted Bran	9.8	5.6	2.0[2]	58.6	332
	Vitæ Health Food Co., Seattle, Wash.:					
1925	Starch-free Bran[4]	22.4	8.9	5.8[2]	27.8	304
	Gerda H. Wagner, Brooklyn, N. Y.:					
1924	Diabetic Cereal	10.1	4.6	1.4[2]	58.8	323
	Waukesha Health Products Co., Waukesha, Wis.:					
1919	Hepco Grits	40.3	16.4	0.9	23.9	408
	Woman's Baking Co., Boston:					
1921	Washed Bran	11.2	7.4	4.6[2]	..	..
	MACARONI, NOODLES, ETC.					
	Brusson, Jeune, Villimur, France:					
1913	Petites Pates au Gluten	17.0	1.0	61.2	10.8	365
	Callard & Co., London:					
1922	Casoid Flakes	78.5	3.1	1.2[2]	None	347
1922	Casoid Vermicelli	80.0	2.7	0.5[2]	None	346
	The Dieto Food Co., New York:					
1914	Whole Wheat Brand Macaroni	13.9	1.1	58.7	15.0	361

[1] Includes fiber.
[2] Includes soluble carbohydrate.
[3] Largely unavailable.
[4] Soy bean product.

TABLE 36.—COMPOSITION OF SPECIAL FOODS.—(*Continued.*)

Date of analysis.	Manufacturer or agent and name of product.	Protein, per cent.	Fat, per cent.	Carbohydrate.		Calories, per 100 gm.
				Starch, per cent.	Other carbohydrate, per cent.	
	MACARONI, NOODLES, ETC.—*Concluded.*					
	Jireh Diabetic Food Co., New York:					
1913	Macaroni	16.9	0 9	58.8	12.6	361
	Kramer Surgical Stores, New York:					
1926	Broad Noodles	41.3	5.1	5.6[1]	33.8	369
1926	Fine Noodles	41.7	5.1	4.7[1]	34.6	370
1926	Macaroni	41.8	4.8	4.5[1]	32.9	360
	Eugene Loeb, New York:					
1913	Home Made Noodles	41.8	5.5	36.7	5.0	384
	Loeb's Diabetic Food Bakery, N. Y.:					
1919	Gluten Noodles	37.3	3.6	36.8	10.3	370
	Pure Gluten Food Co., New York:					
1914	Hoyt's Gum Gluten Noodles	36.9	1.2	41.8	10.8	369
	NUTS AND NUT PREPARATIONS.					
	Dieto Food Co., New York:					
1914	Pine Nuts	39.7	50.0	None	2.8	620
	Chas. Lawrence Co., Boston, Mass.:					
1913	California Paper Shell Almonds, edible portion	18.4	55.3	None	16.3	637
	Christian National Food Co., Kenilworth, N. J.:					
1916	Christian's Protoid Nuts	37.6	48.2	Trace	5.7[1]	607
	Jireh Diabetic Food Co., New York:					
1913	Diabetic Pine Nuts (Pignolias)	39.7	49.4	None	3.4	617
	The Kellogg Food Co., Battle Creek, Mich.:					
1913	Nut Bromose (Meltose and Nuts)	17.1	26.8	3.2	36.2	467
1913	Pine Nuts	38.0	49.6	4.2		615
	Nashville Sanitarium Food Co., Nashville, Tenn.:					
1913	Malted Nut Food	24.7	42.7	3.4	24.1[1]	593
1913	Nut Butter	28.0	52.6	3.8	9.2	637
1913	Nutcysa	12.9	21.0	Trace	6.3	266
1913	Nutfoda	20.8	8.0	Trace	6.8	182
	CHOCOLATE AND CHOCOLATE PREPARATIONS.					
	Brusson, Jeune, Villimur, France:					
1913	Chocolate and added Gluten a la Vanille	15.9	49.7	9.2	17.2	617
	Callard & Co., London:					
1923	"Casoid" Chocolates	22.9	38.8	5.0[2]	23.0	553
1923	"Casoid" Dessert Chocolate	24.9	46.1	7.9[2]	11.3	591
1923	"Casoid" Nut Chocolate	23.9	46.4	8.6[2]	11.3	593
1923	Chocolate Biscuits	26.1	49.8	5.6	9.2	612
1923	Sugarless Chocolate	14.0	44.3	14.0[2]	17.3	580
1925	"Casoid" Chocolate Creams	21.8	21.6	4.8[2]	35.8[3]	443

[1] Includes fiber. [2] Includes soluble carbohydrate. [3] Glycerin present.

TABLE 36.—COMPOSITION OF SPECIAL FOODS.—(*Continued.*)

Date of analysis.	Manufacturer or agent and name of product.	Protein, per cent.	Fat, per cent.	Carbohydrate.		Calories, per 100 gm.
				Starch, per cent.	Other carbohydrate, per cent.	
	CHOCOLATE AND CHOCOLATE PREPARATIONS—*Concluded.*					
1925	"Casoid" Chocolate Peppermints	22.3	20.5	4.1[1]	36.0	434
1925	"Casoid" Chocolate Truffles	27.8	46.7	5.2[1]	9.3	589
1925	"Casoid" Marzipan Chocolate	24.8	37.2	4.2[1]	21.2[2]	536
	Fritz, Vienna:					
1924	Cakes with Chocolate Icing	24.9	31.3	25.6[1]	9.5	521
1924	Dr. Fromm's Conglutin Schokolade	18.2	36.7	3.8	29.4	536
1924	Ferment-Scho-Kolade	6.3	48.8	26.7[1]	15.1	631
1924	Nut Chocolate	19.2	54.4	4.9[1]	13.0	638
1924	Saccharin-Schokolade	17.3	42.7	12.7[1]	18.0	576
	Fromm & Co., Dresden:					
1913	Conglutin-Diabetiker-Schokolade	17.6	39.1	4.3	28.4	553
	Karl Goldscheider, Karlsbad:					
1914	Feinste Dessert-Schokolade für Diabetiker, "9.98 per cent carbohydrates"	11.4	57.6	5.0	20.4	665
1914	Feinste Mocca-Schokolade für Diabetiker, "10.26 per cent carbohydrates"	10.2	60.2	4.1	19.4	677
1914	Feinste Nuss-Schokolade für Diabetiker, "11.32 per cent carbohydrates"	14.6	54.4	6.9	16.4	641
1914	Feinste Orange-Schokolade für Diabetiker, "9.98 per cent carbohydrates"	11.4	57.6	5.0	19.9	664
	Laboratoire E. Storage, Marseilles, France (Hygienic Food Co., New York, Distributors):					
1924	Croquetts de Chocolate Sucre	22.1	26.5	29.9[1]	10.6	488
1924	Pastilles de Chocolate	21.0	25.9	30.7[1]	12.0	488
	Loeb's Diabetic Food Bakery, New York:					
1919	Almond Chocolate Bars	14.9	53.2	5.3	15.6	622
1919	Diabetic Chocolate	14.7	51.7	7.3	15.5	615
	Plasmon Co., London:					
1923	Plasmon Chocolate	13.8	29.4	38.5[1]	14.4	531
	Rademan's Nahrmittelfabrik, Frankfurt:					
1913	Diabetiker-Chokolade	17.5	57.6	3.8	13.1	656
1926	Schokolade Dessert for Diabetiker	12.3	55.4	10.1[1]	14.9	648
	COCOA.					
	Callard & Co., London:					
1923	Biogene Cocoa	33.1	17.9	11.1[1]	19.8	417
	Cheltine Food Co., Cheltenham, Eng.:					
1923	Cheltine Milk Cocoa	47.1	15.9	8.9[1]	13.1	420
	The Dieto Food Company, New York:					
1914	Dieto Cocoa	23.6	22.9	12.4	26.6	456

[1] Includes soluble carbohydrate.

[2] Glycerin present.

TABLE 36.—COMPOSITION OF SPECIAL FOODS.—(*Continued.*)

Date of analysis.	Manufacturer or agent and name of product.	Protein, per cent.	Fat, per cent.	Carbohydrate.		Calories, per 100 gm.
				Starch, per cent.	Other carbohydrate, per cent.	
	COCOA—*Concluded*					
	H. & R. Diabetic Foods, Bronx, N. Y.:					
1924	Cellu Cocoa Nibs	8.3	30.1	4.2[1]	42.8	492
	Loeb's Diabetic Food Bakery, New York:					
1923	Diabetic Cocoa	25.4	20.9	16.0[1]	23.1	446
	Gustav Müller, New York:					
1913	Charrasse Gluto-Cacao	21.5	22.2	16.3	23.8	446
	Plasmon Co., London:					
1921	Cocoa	50.4	11.6	6.0[1]	13.1	382
	Rademan's Nahrmittelfabrik, Frankfurt:					
1913	Diabetiker-Cacao	17.6	23.6	10.7	34 0	462
	SUGAR-FREE MILK.					
	Gustav Müller & Co., New York:					
1913	Dr. Bouma Sugar-free Milk	2.4	5.3	..	..	57
	D. Whiting & Sons, Boston, Mass.:					
1919	Sugar-free Milk	6.4	9.3	..	0.2[2]	110
1922	Sugar-free milk	6.6	8 6	..	0.5[2]	106
	FRUITS AND VEGETABLES (CANNED).					
	Callard & Co., London:					
1925	Cranberries, Sugarless	0.3	..	1.3[1]	..	..
1925	Plums, Sugarless	0.3	..	1.5[1]	..	..
	The Diaprotein Co., Columbus, Ohio:					
	"Dieta" Brand Products:					
1921	Apple Sauce	0.2	0.6	5.8[1]	3.7	44
1921	Blackberries	0.7	0 5	2.6[1]	2 4	27
1921	Cherries, Red, Pitted	0.5	0.1	5.1[1]	3 4	37
1921	White	0.7	0 1	3.8[1]	3.5	33
1921	Peaches, Yellow	0.5	0.1	2.9[1]	2.5	25
1921	Pears, Bartlett	0.3	0.1	2.5[1]	2.7	23
1921	Raspberries, Red	0.9	0.7	3.0[1]	4.0	38
1921	Strawberries	0.6	0.4	2.0[1]	2.4	24
1921	Beans, Cut, Wax	0.8	0.1	1.2[1]	0.5	11
1921	Refugee, Green	1.0	0.1	1.4[1]	0 8	14
1921	Peas, Green	3.2	0 4	3.9[1]	2.2	41
1921	Rhubarb	0.4	0.1	0.3[1]	1.9	11
1921	Spinach	3.1	0.6	0.6[1]	1.0	24
1921	Tomatoes	1.0	0.2	1.5[1]	1.3	17
	The Poms Co., Sarasota, Fla.:					
1924	Grapefruit (Poms)	0.5	0.1	4.2[1]	4.1	36
	The John Sexton & Co., Chicago, Ill.:					
1924	Apricots, Edelweiss	0.4	0.1	4.9[1]	3.8	35
1924	Apricots, Pride of the West	0.4	0.1	4.8[1]	3.3	35
1924	Blackberries, Alp Rose	1.0	0.7	5.6[1]	4.8	52
1924	Blueberries, Alp Rose	0.4	0.3	7.6[1]	4.5	53
1924	Cherries, Edelweiss	0.6	0.1	4.2[1]	4.9	39
1924	Cherries, Pride of the West	0.6	0.1	4.9[1]	5.2	43
1925	Cherries, Alp Rose Black	0.6	0.3	10.0[1]	6.0	69
1925	Cherries, Alp Rose Red Pitted	0.5	0.3	7.0[1]	4.9	52

[1] Includes soluble carbohydrate.

[2] Lactose.

TABLE 36.—COMPOSITION OF SPECIAL FOODS.—(*Continued.*)

Date of analysis.	Manufacturer or agent and name of product.	Protein, per cent.	Fat, per cent.	Carbohydrate. Starch, per cent.	Carbohydrate. Other carbohydrate, per cent.	Calories, per 100 gm.
	—FRUITS AND VEGETABLES (CANNED) *Concluded.*					
1924	Cherries, Alp Rose Royal Anne	0.6	0.1	7.6[1]	5.1	54
1924	Grape Fruit, Alp Rose	0.7	0.1	4.9[1]	3.3	36
1924	Logan Berries, Alp Rose	1.0	0.7	5.6[1]	5.1	53
1924	Peaches, Edelweiss	0.4	0.1	4.0[1]	3.2	31
1924	Peaches, Pride of the West	0.4	Trace	4.8[1]	2.6	31
1924	Pears, Alp Rose Bartlett	0.3	0.1	4.3[1]	5.3	40
1924	Pears, Edelweiss	0.2	0.1	3.7[1]	4.8	36
1924	Pears, Pride of the West	0.2	0.1	3.6[1]	4.7	35
1924	Pineapple, Alp Rose Hawaiian, Sliced	0.4	0.1	8.5[1]	4.6	55
1924	Pineapple, Pride of the West	0.4	0.1	9.7[1]	3.2	54
1924	Plums, Alp Rose Japan	0.3	0.1	2.8[1]	2.9	25
1924	Plums, Alp Rose Prune	0.3	0.1	6.9[1]	3.5	44
1924	Plums, Pride of the West Prune	0.4	0.1	4.8[1]	5.3	43
1925	Raspberries, Alp Rose Black	0.8	1.1	3.3[1]	3.8	42
1924	Raspberries, Alp Rose Red	0.7	0.5	4.8[1]	3.0	34
1925	Strawberries, Alp Rose	0.4	0.3	2.0[1]	2.4	22
1924	Asparagus, Alp Rose Peeled, White	1.2	0.1	1.5[1]	0.8	15
1924	Asparagus Tips, Alp Rose White	1.7	0.1	1.6[1]	1.0	18
1925	Beans, Alp Rose Refugee (small green)	1.0	0.1	1.4[1]	1.4	16
1925	Beets, Alp Rose (small)	1.3	0.1	8.4[1]	4.6	58
1925	Peas, Alp Rose (sifted early June)	2.6	0.2	4.2[1]	1.5	34
1925	Sauerkraut, Edelweiss	1.1	0.2	0.4[1]	2.3	17
1925	Spinach, Alp Rose	2.9	0.5	1.0[1]	1.9	28
1925	Sweet Corn, Alp Rose	2.1	1.1	10.3[1]	2.5	69
	Washington County Co., Dennysville, Me.:					
1925	Aunty's Mountain Cranberries	0.5	0.8	3.3[1]	11.4	68
1925	Aunty's Blueberries	0.7	0.9	8.0[1]	7.2	72
	MISCELLANEOUS PRODUCTS.					
	Callard & Co., London:[2]					
1925	Sugarless Jam, Apricot	3.9[3]	..	3.3[1]	..	..
1925	Sugarless Jam, Green Gage Plum	5.0[3]	..	2.8[1]	..	..
1925	Sugarless Jam, Plum	5.0[3]	..	1.7[1]	..	..
1925	Sugarless Marmalade, Orange	5.8[3]	..	1.2[1]	..	..
1925	Sugarless Jelly, Pineapple	6.8[3]	..	..	..	..
1925	Ponos Marzipan	20.1	34.7	3.1[1]	23.8	500
1925	Ponos Marzipan (Creme de Menth)	21.8	45.4	2.7[1]	15.9	570
	Manual Freres:					
1917	Longuets de Lausanne	14.2	5.5	49.2	16.9	371
	Health Food Co., New York:					
1913	Kaffeebrod	12.9	1.5	10.1	62.4	355
	Jell-O Company, Le Roy, N. Y.:					
1924	D-Zerta[3]	72.8[4]	0.1	None[1]		..

[1] Includes soluble carbohydrate.

[2] The jams, jellies and marmalades made by this company for diabetic diets are packed with from 10 to 45 per cent of glycerin.

[3] Ash, 1.7 per cent; undetermined (chiefly water and organic acids), 25.4 per cent.

[4] Gelatin (N × 5.55).

TABLE 36.—COMPOSITION OF SPECIAL FOODS.—(*Concluded.*)

Manufacturer or agent and name of product.	Protein, per cent.	Fat, per cent.	Carbohydrate.		Calories, per 100 gms.
			Starch, per cent.	Other carbohydrate, per cent.	
LAXATIVE FOODS.					
Bran Products, etc.:					
Bran (so-called "health bran" for dietetic use), average of six commercial brands	15.6	4.8	55.8		329
Bran Biskue	12.1	13.1	61.0		410
Bran Zos	13.2	2.5	65.6		338
Bran-eata Biscuit	9.1	0.9	72.2		333
Brose Good Health Breakfast Food	14.4	4.3	65.5		358
Cerag	11.3	0.9	73.0		345
Christian's Laxative Bread	10.0	1.4	74.6		351
Colax	1.1	0.8	82.8		343
Dietetic Bran Biscuit	9.9	5.0	69.1		361
Educator Bran Cookies	8.9	14.5	64.7		425
Educator Bran Meal	12.3	2.8	66.4		340
F.B.A. Health Biscuit	6.1	1.7	77.3		349
Fruit Nut Cereal	13.5	1.2	72.4		354
Good Health Biscuit (Kellogg)	7.7	1.2	74.5		340
Health Food Wafers	10.0	7.9	65.7		374
India (Digestive) Biscuit	12.8	2.2	66.1		335
Laxa	12.4	2.8	66.6		341
Laxative Biscuits (Kellogg)	16.7	10.8	57.7		395
Mansfield's Agar-Agar Wafers	7.1	12.0	69.9[1]		416
Oval Digestive Biscuit (H and P)	7.8	16.3	64.5		436
Uncle Sam Health Food	21.3	24.4	40.9		468
Zim	7.4	1.7	74.2		342
DiaBiskit (Jackson)	17.6	4.8	6.1[2]	47.2[3]	..

[1] Carbohydrate of agar-agar largely unavailable.
[2] Includes soluble carbohydrate.
[3] Carbohydrate largely unavailable.

CHAPTER XXVII.

SELECTED LABORATORY TESTS USEFUL IN DIABETIC TREATMENT.

An early diagnosis in diabetes is as important as in tuberculosis and is far more easily made. The disease usually begins insidiously and its prompt detection depends upon the routine examination of the urine of everybody rather than upon the examination of the urine of patients who present symptoms of the disease. General practitioners should teach their patients, as a matter of routine, to have their own urines and the urines of the members of their families examined each birthday. Each diabetic should protect his father, mother, brother and sister by making a yearly examination of the urine and a semi-annual examination, if the relative is over fifty years of age. Every boy and girl who studies chemistry should be taught the Benedict test.

Although diabetic patients can test their own urines for sugar, and almost invariably are warranted in relying upon the result of their examination, they should not feel that they are expert analysts. More than once patients have arrived at erroneous conclusions, in part due to the preparation of chemical reagents employed. It is therefore safer for all diabetic patients to send their urines once a month to their physician. If the urine is free from sugar, such an examination can be made by a physician within fifteen minutes. A microscopic examination or a quantitative examination for sugar demands half an hour more or less.

The Collection of Urine.—To collect the twenty-four hour quantity of urine, discard that voided at 7 A.M. and then save in a cool place all urine passed thereafter up to and including that obtained at 7 A.M. the next morning.

It has become increasingly important since the advent of insulin to examine separately the urine voided after meals and during the night. The urine voided between 7 A.M. and just before the noon meal constitutes the morning (M) urine; that until the evening meal the afternoon (A) urine; that until retiring the evening (E) urine; after retiring until and including 7 A.M. the night (N) urine. If sugar is found in the twenty-four-hour urine one can learn by a study of the morning, afternoon, evening and night specimens whether this occurs uniformly throughout the entire day or at a single period. If the latter is the case, an investigation will disclose whether (*a*) and excess of carbohydrate has been taken at the previous meal; (*b*) the quantity of insulin has has been inadequate, because of (1) insufficient quantity or (2) faulty administration due to repeated injections in a single area of the body or to the interval before the meal being too short or (*c*) lack of exercise. When sugar is found in all four specimens of urine the total diet including carbohydrate should be lowered, insulin raised and sometimes exercise increased. The question of increase or decrease in exercise however depends upon various factors, such as the existence of an intercurrent infection, which of itself usually brings back sugar in the urine. The bedridden patient without fever should always take bed gymnastics.

Reaction.—The normal urine is acid. Urine voided after a meal rich in vegetables and fruits is frequently alkaline, due to the alkaline salts which they contain. Therefore the report that the urine is acid does not imply in the slightest degree that a patient has acid poisoning.

Examination of the Urine for Sugar.—The urines of healthy individuals and of carefully treated diabetics do not show sugar by the routine Benedict test for sugar. Sugar can be demonstrated readily if it amounts to as little as 0.05 per cent, and it may rise to as high as 9 or 10 per cent when the diabetic diet is not followed. Most untreated cases show between 2 and 6 per cent of sugar. The total quantity of sugar in the urine in the twenty-four hours is easily estimated by multiplying the percentage of sugar which the urine contains by the total amount of urine voided. Thus, if the total quantity

of urine is 3000 cc. (1 quart equals 946 cc. and for rough calculations can be considered equal to 1000 cc. or 1 liter) and the percentage of sugar is 4 per cent, the amount of sugar in the urine would be (3000 by 0.04) 120 grams, that is, since 30 grams equal 1 ounce, about 4 ounces or $\frac{1}{4}$ pound. It is not very often that one finds more than 1 pound of sugar excreted in the urine during twenty-four hours. The food value of sugar lost, if only 120 grams, is considerable. Each gram of sugar is equivalent to 4 Calories, and 120 grams would amount to 480 Calories in a day. This is nearly one-fourth of the total food value required by an individual with a quiet occupation who weighs 60 kilograms (132 pounds). Thus, it is evident, that 4 untreated diabetics, even though the disease is of very moderate severity, provided they eat enough to make up the loss, will waste in a day enough food to supply the needs of a normal individual of equal weight for the same space of time.

The Benedict Test for Sugar.—Many tests for sugar in the urine are employed. The Benedict test[1] is one of the best. As used with urine, the test is sufficiently delicate to detect quantities as small as 0.08 or 0.1 per cent sugar. The Benedict solution employed has the advantage of not decomposing, even after months. (See Frontispiece.)

The test is carried out as follows: Eight (not more) drops of the urine to be examined are placed in a test-tube and to this are added 6 cc. (an ordinary teaspoon holds about 5 cc.) of Benedict's solution. The tube is shaken to mix the urine and solution and then placed in water that is already boiling. After being in the boiling water for five minutes the tube is removed and examined for evidence of sugar. In the presence of sugar the entire body of the solution will be filled with a precipitate, which may be greenish, yellow or red in color, according to whether the amount of sugar is slight or considerable. If the solution remains clear, the urine being tested is sugar-free; if one can read print through the solution the percentage of sugar is so slight that it can be disregarded; if a heavy greenish precipitate forms, it usually means there

[1] Benedict, S. R.: Jour. Am. Med. Assn., 1911, **57**, 1193.

is a trace of sugar; the appearance of a yellow sediment indicates the presence of a few tenths per cent of sugar in the urine, and a red sediment more than 1 per cent.

Upon removal from the boiling water shake the test-tube. The discoloration which occasionally forms upon the surface is unimportant and with shaking disappears.

The chief points to be remembered in the use of the Benedict reagent are: (1) The addition of not more or less than 8 drops of urine, delivered from an unbroken medicine dropper; (2) the use of not less than 5 cc. or more than 8 cc. of Benedict's solution ; (3) the transfer of the tube to water, actually boiling, where it should remain for five minutes; (4) the change in color and transparency of the solution is the criterion for a positive test for sugar.

The formula and directions for preparing the Benedict solution follow: They should be strictly adhered to in preparing the solution.

	Grams or cc.
Copper sulphate (pure crystallized)	17.3
Sodium or potassium citrate	173.0
Sodium carbonate[1] (anhydrous)	100.0
Distilled water to make	1000.0

[1] The crystallized (10 molecules of water) Na_2CO_3 is more soluble; 270 gm. of the crystals are equivalent to 100 gm. of the anhydrous salts.

The citrate and carbonate are dissolved together (with the aid of heat) in about 700 cc. of water. The mixture is then poured (through a filter if necessary), into a larger breaker or casserole. The copper sulphate (which should be dissolved separately in about 100 cc. of water) is then poured slowly into the first solution, with constant stirring. The mixture is then cooled and diluted to 1 liter. This solution keeps indefinitely.

If doubt arises in the patient's mind about the reliability of his Benedict solution, he can test it by performing the usual test for sugar by substituting 8 drops of orange juice for urine. Cane sugar which is our usual table sugar does not give the test. Cane sugar when eaten immediately changes to dextrose and levulose and both these forms of sugar act upon Benedict's solution. The test with orange juice changes the Benedict's solution to a bright red color.

Quantitative Tests.—It is one of the chief advantages of modern treatment that the need for these tests is nearly abolished. The simplification of the treatment of diabetes means everything to the practitioner and patient. At the beginning of treatment, however, it is desirable to follow the reduction of sugar excreted along with changes of the diet and the determination of the percentage of sugar in the urine is indicated.

This is the method used routinely in the laboratory of the New England Deaconess Hospital. The test can be performed in a minimum of time, is very simple, and if carefully carried out furnishes sufficiently reliable data. It is not necessary to calculate the final percentage of sugar for this can be read directly on the special pipette used for titrating. The method is described in detail below.

The apparatus[1] needed consists of a small ring stand with test-tube clamp, a micro-Bunsen burner or small alcohol lamp, a pyrex test-tube (18 by 150 mm.), a Millard Smith pipette No. 2, and one 1 cc. Ostwald pipette.

With the Ostwald pipette transfer 1 cc. of Benedict's original quantitative solution into the test-tube (held in the ring stand clamp) and then add 0.2 to 0.7 gram of anhydrous sodium carbonate. A small well-dried pebble, or a piece of quartz, or a pinch of talcum powder should also be added to prevent bumping.

Heat the mixture to boiling and add the urine from the Smith pipette drop by drop until reduction is complete as evidenced by the disappearance of the blue color. Read the percentage of sugar directly from the pipette. The approximate strength of the urine, with a slight amount of experience, is easily estimated from the qualitative Benedict test. Urines expected to contain 1 per cent or less of sugar are titrated directly. Those over 1 per cent are diluted ($\frac{1}{1}\frac{}{0}$ or $\frac{1}{2}\frac{}{0}$) before titration and necessary calculations made after titrating. All dilutions of the urine reduce, of course, the accuracy of the results obtained due to dilution of the urinary salts.

For *rapid* reduction of the reagent, vigorous boiling is

[1] The apparatus may be purchased from many surgical supply houses or from the manufacturers, Emil Greiner Company, 55 Vandam Street, New York City.

essential, which may result in too rapid evaporation. This is avoided by allowing more time for reduction between additions of urine.

The best results are obtained if the solution is kept *at* the boiling point by manipulation of the flame and the urine added slowly. A very small flame should be employed. *The tendency in this titration of sugar is to go past the end-point. When nearing the end-point the urine must be added slowly.* In urines of low sugar content the boiling should be rather vigorous at first in order to maintain a constant volume while the 1 to 2 cc. of urine necessary to give complete reduction are being added. With a moderate amount of practice the regulation of the volume of the boiling solution becomes quite simple.

Methods for the Determination of the Urinary Acids.—Qualitative Tests. - *Diacetic Acid* (CH_3COCH_2COOH).—The simplest method for the detection of acidosis by urinary examination is Gerhardt's ferric chloride reaction for diacetic acid. The test may be performed as follows: To about 10 cc. of the fresh urine carefully add a few drops of an undiluted aqueous solution of ferric chloride, Liquor Ferri Chloridi, U. S. P. A precipitate of ferric phosphate first forms, but upon the addition of a few more drops is dissolved. The depth of the Burgundy red color obtained is an index to the quantity of diacetic acid present. I record the intensity of the reaction as follows: +, ++, +++ or ++++.

Confusion as to the significance of the test arises if the patient is taking sodium salicylate, aspirin, antipyrin, cyanates, or acetates. This is to a considerable extent avoided by vigorously boiling the urine after the addition of the ferric chloride, when the deep color markedly decreases or disappears if caused by diacetic acid, but remains the same if caused by the above drugs.

Acetone (CH_3COCH_3).- The different tests for acetone are in reality tests for diacetic acid. Legal's test is as follows: A few crystals of sodium nitroprusside are dissolved in 5 cc. of urine, which is then rendered alkaline with sodium hydrate. Shake vigorously. Two drops of glacial acetic acid are then allowed to run down the side of the test-tube and a distinct purple color appears.

INDEX.

A

Abrasions of the skin, 131
Acetone in urine, test for, 244
Acid intoxication. *See* Acidosis.
Acidosis, 119–126. *See* also Coma.
  insulin, use of in, 120
  prevention of, 39
  treatment of, 121, 122
Administration of insulin, 110
Agar-agar, 180
Alcohol, 92
Alcoholic beverages, 221
Anesthetics, 40
Apples, 83
Arithmetic, diabetic, 42
Artichokes, 81, 181
Avoirdupois system, 42

B

Bacon, directions for weighing, 71
Bananas, analysis of, 83
Benedict's test, qualitative, 241
    quantitative, 243
Berries, 218–220
Beverages, 221
Blood sugar, 21, 36, 56, 57
Body height and weight tables, 150–153
Boiled dinner, 182
Boils, 132
Bottles, percolator, 54
Bouillon cubes, 93, 184, 210
Bran, 214, 232, 238
  bread, 175
  wafers, 176, 185
Bread, analyses of, 86, 211
    bran, 175
    diabetic, so-called, 226–232
Bread, analyses of, gluten, 176
    substitutes for, 174
Broths, 89, 210
Butter, 91, 210
Butterine, 91
Buttermilk, 209

C

Cabbage, 81
Caloric needs, 66–69
    in diabetes, 76–99
Calories, definition of, 37
Camps for diabetic children, 168
Cane sugar, 34
Carbohydrate, estimation of, in clinical work, 44
  foods, content of, 47
  in diabetic diet, 79
  in normal diet, 69–74
  in one ounce, 49
  in vegetables, 47
  insulin, value of, 29
  tolerance for, 117
  where found, 34, 35
Carbuncles, 133
Cereals, 210–215, 232
Cheese, 72, 89
Children, 164–171
  discipline of, 164, 165
  heights of, 150, 151
  mortality statistics, 22, 23
  weights of, 150, 151
Chittenden, low-protein diet, 87
Chocolate, 234
Clams, 208
Clothes, 64
Cocoa cracked, 179, 234
  shells, 159
Coma, diabetic, 119–126. *See* also Acidosis.

Coma, diabetic, diagnosis of, 125
rules for doctor, 122
for patient, 121
treatment of, 121, 122
Constipation, 136–138
Corns, care of, 130, 131, 134
Cough medicine, 91
Crackers, carbohydrate in, 86, 211
Cream, 91, 209
Crisco, 91

D

Daily menu for diabetics, 17
Dairy products, analysis of, 209
Diabetes, comparison with other diseases, 19
complicated by presence of other diseases, 114
definition of, 19
history of, 26–32
prevention of, 39
symptoms of, 20
treatment with diet and insulin, 95, 103
Diabetic children, 164–171
Diacetic acid, test for, 244
Diagnosis, differential of coma, 125, 126
Diarrhea, 105, 115, 138
Diet, computation of, 50, 51
cost of diabetic, 156
diabetic, 75–94
normal, 65–74
vs. diabetic, 75, 76
sample, 183
special diets, 115
standard diets, 97, 103, 173, 182, 183
Dietetic treatment, 95
Diets, maintenance, 103
Dinner-pail lunches, 199
Dogs, diabetics and their friends, 162, 163
Drinking glasses, capacity of, 43
Dropsy, diabetes and, 154, 155

E

Eggs, 71, 89, 156, 208
Epidermophytosis, 132
Excitement, effect of, 64, 146
Exercise, 60
for constipation, 137
insulin and, 105
Expectation of life, 142
Extracts, 179

F

Fat, content of diabetic diet, 90
of normal diet, 70
danger to diabetic, 92
people. *See* Obesity.
Feet, care of, 129–131
Fish, 88, 207, 208
Flour, 222–225
Food, diabetic, so-called, 202–238
requirements, 36
scales, 49
special, composition of, 222
Four-period tests, 55, 108, 109, 168, 240
Fruit, 82, 83, 218–220, 236
Furunculosis, in diabetes, 132

G

Gall stones, 134, 147
Gangrene, 129
Gingerale, 221
Gluten breads, 176
Glycogen, animal starch, 34, 65, 66
Grapefruit, 47, 219
Grape juice, 219
Gum, India, 177

H

Health examination, value of, to diabetic, 24
Height and weight tables, 150–153
Heredity, 140
High blood-pressure in diabetes, 114
Hunger, 33
Hygiene for the diabetic, 60–64

I

Ice cream, diabetic, 178, 188, 189, 209
Infections, 105, 130

Injuries of skin, 131
Insulin, acidosis, use of, in, 120
adjustment of dosage when food is not retained, 105
administration of, 110
Banting and Best's discovery of, 26
carbohydrate value of, 29, 37
dangers of, 38
directions for taking, 110
dosage, 29, 38, 95, 105
effects, duration of, 104
excess, result of, 30
history of, 26–32
improvement in mortality with, 22, 23, 24
infections and, 105
instructions for giving, 110, 160
lasting effects of, 104
map for injections, 113
Opie's and Ssobolew's discovery of Islands of Langerhans, 28
problems, 107
reactions, diagnosis of, 125
symptoms of, 30
record of, 56
standardization of, 29
strength in which it can be bought, 160
syringe, use of, 160
times of administration of, 104
time of maximum effect of, 104
treatment with, 103
unit of, 29, 160, 161
Irish moss, 179
Islands of Langerhans, 27, 28
Itching, 131

J

Jelly, agar-agar, 180
Jerusalem artichokes, 81, 181

K

Kidney disease associated with diabetes, 114
Koumiss, carbohydrate in, 72

L

Laboratory tests, 239
Langerhans, islands of, 27, 28
Laxatives, 136, 238
Lettuce, 81
Liquids in coma, use of, 122
in diabetes, 93
Liver, 34, 65, 66, 205
Lunches, dinner-pail, 199
restaurant, 197
school, 196, 197

M

Maintenance diets, 103
Marriage, 140
Meat, 88, 204–207
Mental hygiene, 62
Menus, 182–200
Metric system, 42
Milk and milk products, 71, 72, 84, 209
substitutes, 177
Mineral oil, 91, 136
Mortality statistics, 22, 24, 117

N

Needle, broken during use, rules for, 135
Normal diets, 65–74
Notebook, diabetic, 56
Nuts, 82, 220, 234

O

Oatmeal, 84
Obesity, 140, 143, 145
Oil, dietetic value of, 91
Oleo, 91, 159, 210
Olives, 84
Operations for diabetics, 40
Oranges, 47, 73, 219
Oyster crackers, weight of, 44
Oysters, 89, 208

P

Pancreas, diabetes and, 27, 28
diagram of, 30
Pastry, analysis of, 211, 212
Pickles, 181, 218
Potato, 81, 216

Pregnancy, 141, 147
Prevention of diabetes, 145
Prognosis, 142
Protein, content of in diabetic diet, 87
in normal diet, 69
Pruritus, 131

Q

Questions and answers for diabetic patients, 33–41

R

Reaction, insulin, 30, 38, 125
Recipes for daily menus, 184–200
Renal glycosuria, 19, 36
Rest, 62
Restaurant lunches, 197

S

Saccharin, 62, 179
Salt (sodium chloride), 93, 154
Sample diets, 183
Scales, food, 49
School lunches, 196
Sea moss, 179
Seasoning, 180
Shredded wheat biscuit, 44, 86, 213
Skin, 122, 129
Sodium chloride, 93, 154
Soups, 210
Soy bean, 177
Squab, 182
Standard diet, 97, 103, 173
variations in, 115, 183
Starch, 69, 95
String beans, carbohydrate of, 80, 217
Sugar, blood, 21, 36, 56, 57
consumption of, in United States, 70
in urine, source of, 20
tests for, 241, 243
loss in urine, 33
Surgery in diabetes, 134
Symptoms, coma, 125
diabetic, 20
insulin reaction, 30
Syringe, insulin, use of, 160

T

Tablespoon, capacity of, 43
Teaspoon, capacity, 43
Teeth, care of, 127, 128
Test diets, 103
Thirst, 33
Toast, carbohydrate of, 86
Tolerance, increase in, 117
Treatment, 95–118
coma in, 121, 122
dietetic, 95
problems of, 107
test of successful, 21
weight change during, 154
with insulin, 103

U

Uneeda biscuit, 44
Urine, collection of, directions for, 54, 239
examination of, 54, 55
four-period tests, 55, 108, 109, 168, 240
sugar in, determination of, 240
source of, 20, 35

V

Variations in sizes of common foods, 73
Vegetables, 215–218, 236
carbohydrate in, 47, 215–218
five per cent, 47, 96, 181
ten per cent, 47, 97
thrice cooked, 80
Vinegar, 84

W

Walking, 60
Weight, 149–155
and height tables, 150–153
variations in, 149
Weights and measures, 42
Whey, 72
Worry, 64, 146

Z

Zwieback, 86

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